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Fourteenth Annual
Report
OF THE
Inspector of Mines
OF THE
State of Montana

JOHN BYRNE, Inspector
JOHN J. BARRY, Deputy

December 1, 1902

ENDENT PUBLISHING COMPANY, HELENA, MONTANA.

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"INDEPENDENT PUBLISHING COMPANY, HELENA, MONTANA."

Helena, Montana, December 1, 1902.

To Hon. Joseph K. Toole,
Governor of Montana,

Dear Sir:—I beg herewith to transmit to you my report for the years 1901 and 1902, being the fourteenth annual report of this department.

In this connection I desire to acknowledge the able and valuable services of Deputy Mine Inspector, John J. Barry, and also to return my thanks to mine owners, managers and superintendents for the many courtesies extended to me in the discharge of my official duties.

Very respectfully,

JOHN BYRNE,
State Inspector of Mines.

Mine Inspector's Report.

The condition of the metal mining industry of this State during 1901 and 1902 might be summed up in a phrase. It has been marked by a steady, healthy and satisfactory progress. We have had no boom in any one of the great number of mining districts in the State; and less advertising of our mineral resources than any of the tier of states and provinces which extend from Alaska on the north to Mexico on the south, in fact more effort is being made by some single counties of our sister states to interest capital and encourage the development of their resources than is put forth by the whole State of Montana in the same direction. The little which has been attempted in the bringing of the mineral resources of this State to the attention of those seeking mining investments has been done by individuals, and yet, excepting in a few of the silver producing districts, every section of the State shows improvement over two years ago, and advancement of a character that lends assurance of constant, if slow, progress.

The evolution from a prospect to a paying mine is carried on in this State through the various stages in a gradual and systematic manner. There is nothing in the history of the vast majority of the dividend paying mines of to-day from which the most imaginative can weave an exciting tale. No poor prospector has of late years stumbled onto a body of ore containing fabulous wealth. In fact, accidental discoveries are rarely heard of, and the question of luck as a factor in mining is nearly, if not altogether, eliminated. Take the list of the present producing mines and it would be difficult for the owners, or those who have succeeded to the rights of the original locators to tell when and under what circumstances the mines were discovered. And because the great majority of them are the outgrowth of the economic geological conditions by which they are surrounded and not because of any marked indications exhibited on their outcrop And it may be truly said of such mines that they were made and not discovered.

There is a very general misconception in the minds of foreign mining investors relative to the manner in which commercial ore occurs and values are distributed in the precious metal veins. They frequently express disappointment when on a visit of examination to their properties they learn that all of the vein material found between walls will not pay working charges.

It is absurd to look for any such conditions in the average mine. Certainly there are exceptions, as when a high grade streak of ore will permit a medium grade product for the mill, lean stuff with it and make a medium grade product for the mill, but the pay ores in the average fissure and contact veins do not occur either uniform in size or carrying equal values throughout, (rather is it the rule to find each section of a vein to differ widely in values and frequently in size), thus it is that the most productive mine, however extensively it may be developed, is always in a prospective stage of development.

It matters not to the mine manager who is to-day directing operations on a large scale whether there be one or several great ore bodies developed in a property which he is supervising, the prospecting and development in search of other pay ore chutes goes on, the lean and barren portions of the lode are driven through, both horizintally and to the deep, ultimately reaching point in the vein where mineralization has concentrated and another ore body has been added to those already in sight. By this system of constant development the mine management maintains several years ore reserves ahead and each new ore body encountered adds to the life of the mine anywhere from one to several years according to the size of the ore body uncovered.

That progress has been made during the past two years both in the directions of development and expansion, and under conditions exceptionally adverse to silver production, furnishes the best assurance of the future prosperity and growth of the mineral industry.

The mining and reduction of the metalliferous ores which are distributed over so great an area of this State, will be the predominant industry for generations to come. Other industries suitable to our soil and climate will spring into existence, while farming and stock growing with their kindred industries will grow to enormous proportions but the basis of the future prosperity and wealth of the State will nevertheless rest on its mineral lodes.

A good share of the prosperity which has attended the mining interests is due to the discoveries of the metallurgist and the inventions and improvements of the mechanic and mechanical engineer, and to those who have made a specialty of the recovery of gold from low grade ore through the medium of chemical solutions. These agencies have contributed much to Montana's future. By reducing the cost of the recovery of the metals to a minimum they have made it possible to mine and work at a profit millions of tons of ore which until recently was as so much waste material.

In mining, as in all other lines of trade and industry, failures are met with. The foregoing touching on the manner of ore occurence in lode formations, explains the cause of some. It is quite common to find adjoining claims, worked by their respective owners, located on the same vein, conditions being apparently identical and the respective shafts or workings but a few hundred feet apart, and one will operate at a loss and the other make a profit. A reasonable percentage of the failures may be charged to the man and not to the mine. Many a meritorious piece of mining property is to-day lying idle and condemned because of gross mismanagement. This is particularly true in instances where a group of mining claims are bonded to people living in other states, who, upon securing the bond and accepting the conditions therein, proceed to organize a company and raise the necessary funds to develop the property. They decide to do a certain amount of exploration and make an estimate of the cost which may vary from ten to fifty thousand dollars. After the working capital is subscribed the question of a manager for the enterprise is taken up and one of the members of the company, and perhaps a heavy subscriber to its stock, finds that he has a relative or dependent who, if given a chance would make a mine manager of a high order, and of course it is imperative that some person whom some of the company know personally and can repose confidence in be given charge of operations. It matters not that the person thus selected has no knowledge of mining. He is a bright, apt, observing fellow and will soon learn. About the first act of the manager on his arrival is to select a foreman and he invariably manages to secure a most incompetent one because he will usually secure his services cheap and he was sent there to save money. Some good buildings must be erected on the mines before starting work, and an office with a safe is a necessity. Surface arrangements in general must be provided for generously, particularly with a view of making things comfortable for the members of the company at their coming visit. The property is very likely situated some miles from the nearest town or village, thus requiring a few head of good horses for riding, which the manager has learned is healthy exercise, besides a smart driving team is indespensible, and so on down the line. When work is commenced on the property the men take advantage of the ignorance of the manager and do next to nothing, making work which ordinarily should cost ten to fifteen dollars per foot cost one hundred, and in instances even more, the net result being that the money subscribed to develop the property is spent and comparatively little of it devoted to the purpose for which it was intended. The men who compose the company are disappointed and disgusted and many of them resolve to leave mining severely alone in the future. The lesson which needs to be learned by those engaging in new mining enterprises is that success or failure may largely depend upon the person selected to direct the enterprise, and that an intelligent, competent, energetic manager or superintendent is cheap to the company regardless of the amount of salary which he receives.

Owing to the efforts of the Montana delegation to the International Mining Congress, which held its annual session at Boise City, Idaho, in July 1901, Butte was selected as the place of meeting for 1902, and a session of five days, September 1st to 5th, was decided on. Among other conditions imposed was one that the place selected should contribute a specified sum towards defraying the expenses of the meeting. This was accepted by the citizens of Butte, who proceeded to raise the required amount by subscription, which when done, was placed in the hands of a committee of the leading citizens to be used in furthering the interests of the congress. Generous provision was made for the accommodation and entertainment of the vast number of delegates which they were assured would be in attendance. It was confidently asserted that so vast were the benefits which the mining interests of the State would reap from the bringing together of representative men from every city, town, village and hamlet in the United States, as well as the leading mining and scientific men of every civilized country, that figures would be inadequate to express it, as results would prove. In fact we were as much as told by the President and Secretary of the congress, time and again, that a mining craze of unprecendented proportions would surely follow as a result of the deliberations and action of the congress, and that so great an impetus would be given to the mining industry of this State on account of its work, that the youngest child would not live so long as to see it slacken. The plan upon which the organization is founded is so broad that everybody irrespective of sex or occupation is eligible as a delegate. The cosmopolitan character of the organization is perhaps best shown by naming a few from the long list of those who were empowered to appoint delegates. Governors of States, Mayors of Cities, Town Councils, Boards of County Commissioners, Labor Unions, Boards of Trade, etc., these respective officials and bodies being entitled to appoint a specified number of delegates. From this it will be seen that the Mining Congress in its composition was intended as a happy mixture. The Secretary, Mr. Mahon, for sometime prior to the meeting occupied columns of the daily press every day with long lists of delegates, all prominent men, who had signified their intention of attending. Telegrams and letters were published from scientific men and mining engineers throughout Europe informing the secretary of their interest in the congress and advising him they would surely be on hand unless something unavoidable happened. In truth from the daily reports published of delegates and letters from individuals, the impression went out that nearly every district in the United States would send a delegation, and of their best men too. The number which would be in attendance as given out by the officers of the congress was not less than three thousand and possibly five thousand, exclusive of those representing Montana. It was found on the assembling of the Congress that the estimates respecting attendance were far from reliable, as the number of delegates from all states and countries, exclusive of Montana, did not exceed three hundred. Of the many papers which were read and questions discussed by the congress there was one matter which from first to last overshadowed all others, viz: what place shall be selected for the meeting of the congress in 1903? Between this question and the mutual exchange of complimentary speeches paid by the delegates of one state to the grandeur, beauties, resources, climate, etc., of another, which were passed all around so that nearly every delegation had the satisfaction of hearing their state receive fulsome, laudatory mention, the time of the congress was passed. In justice it must be said that no aggregation of people could be more exacting in their observance of the social amenities. The subjects presented and discussed varied from a paper on the natural beauties possessed by a sister state to a socialist resolution. And let it be said to the credit of the presiding officer of the congress, everything presented received the same smiling recognition. If the so-called Mining Congress were organized along proper lines and its deliberations confined to questions pertaining to the mining interests, both from its scientific and practical aspects, it is hardly to be doubted that much good would result from such a meeting. As it was, a number of excellent papers were read on mining subjects in its various phases. None of these were discussed for lack of time. The United States Geological Survey was represented by five of its most capable men in their respective lines, headed by Mr. Weed. All of these gentlemen contributed something of interest to the mining portion of the congress. Besides these, papers were read on the practical side of mining by Messrs. Tower and Goodale of Butte, Frazer of Idaho and others. Dr. King of Helena read a paper entitled "First aid to injured," that contains so much practical advice as to the things to do in assisting and relieving temporarily those injured in mine accidents, that I have decided to include it as a part of this report. That any good was accomplished by the congress is doubtful, and unless the plan of organization is radically changed I do not believe it capable of doing anything effective.

The metal production for the year 1899 still stands as the greatest in the history of the State, with its aggregate of $68,457,308.00, an increase of $17,138,241.00 or 33 per cent over the preceding year. Copper contributed about five-sixths of this, there having been an increase in the production of that metal of 28,597,831 pounds, while in value that product showed an enormous gain of $14,410,534.00. Silver and lead, with a small increase, made up the total, gold having fallen off slightly in that year. Conditions during 1899 were highly favorable to copper production, good prices prevailed and the demand was fully up with the supply. The production for 1900 as compared with 1899 shows a falling off in the value of the metals amounting to

$4,710,582. The share copper lost in the decrease was $1,114,771. At the same time the production of the metal for 1900 was greater by 396,051 pounds than for the previous year, but the price was lower, which accounts for the difference in value. Nearly all the balance of the decrease was due to a lessened production of silver, as shown in the tabulated statement of production and value included in this report.

The year 1901 shows a heavy falling off in the production of copper, the decrease being 17,966,862 pounds, and this combined with a slightly lower price as compared with 1900, caused a loss in value of $3,075,298, the total decrease being $3,359,107, of which silver makes up the small remainder of loss. The foregoing brief analysis shows that the decrease in production and values is nearly all due to a heavy falling off in the copper output and a lower price for that product. It must not be assumed that this falling off in the output of copper can be attributed to a lessened productive capacity on the part of the mines, nor that the output for that year represented the maximum output of the copper lodes. On the contrary had the market and other conditions which influence the production of this metal been favorable the mines would have responded to demands which would have materially increased the output over that of former years.

During the past two years the gold bearing districts in all parts of the state have attracted more attention than ever before. Numberless small gold properties are undergoing development and many of them show encouraging promise of developing into paying mines. As a consequence of this activity the gold production for the present year, will, I believe, show a material increase.

Accidents.

So much has been said from time to time on the subject of mine accidents, their cause and possible prevention, and with so little effect insofar as the procuring of legislative remedies, that it would seem that accidents which cause the death of one or two persons are of such common occurrence that they fail to arouse a spirit of inquiry as to their cause or excite a disposition to provide remedies for their prevention.

While it is true that the **per cent** of mine accidents in this State compares favorably with that of other states, it is still too high. and the fact that it is so is not due to any lack of effort on the part of this department in enforcing the laws. In the course of official visits of inspection to the mines of the State, every effort is made to correct wrong methods, bad and dangerous practices are condemned and the adoption of meritorious safety appliances earnestly recommended. That the labors of this department is these directions have resulted in a general betterment of conditions in the mines, cannot be disputed. There is still much to be done, however, in this line. The men employed in the large mines of this State are entitled to better protection than they are now receiving or can receive under the present laws. The fault with the present laws, excepting a few specific acts, is in their negative character. As for instance, the inspector in the course of an examination of a mine finds some working or traveling way not properly timbered, or a shaft, man-hole or winze not properly protected, or men working in foul of vitiated air, or finds which is very common, that men are being lowered or hoisted through deep shafts at a dangerous rate of speed. He is powerless to remedy any of these evils then and there, his authority being limited to serving a notice on the person in charge stating fully and in detail in what particular manner such mine is dangerous or insecure and recommending all necessary repairs and changes to be made without delay. The part of the statute, Political Code, section 584, upon which the inspector depends for obedience to his recommendations, is that which provides "that in case of loss of life or bodily injury being sustained by any employee in consequence of a neglect to obey the inspector's requirements, a certified copy of the inspector's notice is prima facie evidence of the gross negligence of the party or parties so complained of." Thus a notice or recommendation of the inspector may be disregarded with impunity so long as no accident occurs, and, as a matter of fact, many persons in charge of mines take all the advantage that such an ambiguous, negative, weak law affords them, and usually do as they please about the notice and recommendations. They will subject their employees to the dangers pointed out, trusting to luck, and knowing that no penalty attaches to non-compliance with such notice unless in case of death or bodily injury, and then the heirs have to prove carelessness on the part of the management. This, in effect, is the general law which governs this department and under its provisions results beneficial to the general welfare of the underground worker are extremely hard to obtain.

The conduct of the Legislative Assemblies toward this department since its creation has been of a distrustful character. Whenever a question of amending the laws relating to this department, vesting it with authority more direct and positive, has been suggested, it has invariably been frowned down on the ground of bad public policy by reason of the exactions which could be imposed on the mining interests by the officials intrusted with the duty of enforcing such laws. The agents of some of the large mining corporations have from time to time effectively used the argument when opposing legislation designed to afford a larger measure of protection to the miner, that legislation which conferred on this department the authority to enforce at once all orders relative to making safer conditions and stopping dangerous practices, carried with it a license to abuse the authority by the officials charged with its execution.

That the determination of a question involving human life should be influenced by arguments of so shallow and groundless a character is beyond comprehension, and considering the nature of the relations between this or any appointive office and the state and its chief executive, is absurd. Is it not a fact that each and every appointive officer may be called upon by the Governor at any time to explain his official conduct in any matter where he has failed to perform his duty or abused the authority invested in him? And does not every state officer hold himself responsible for his every official act to the chief executive? It would appear that immunity from stricter regulations based on such pleas should have no further force or effect with the general assembly, and it is to be earnestly trusted that the eighth session of the Legislative Assembly will in their deliberations give to the subject of mine accidents the attention which its importance demands.

During the year 1901 the number of fatal accidents was 35, or 3 per thousand men employed. The number of non-fatal accidents reported was 33. In proportion to the number of men employed there were fewer fatal accidents during 1901 than during any year previous to that time. Of the total number of fatal accidents Silver Bow County furnished 24, all the other counties 11. The following summary shows the causes of the fatal accidents during 1901.:

Explosion of blasting compounds,	3
Falls of rock	11
By cages in shafts	5
Falling down shafts	7
Falling from bucket or crosshead while being hoisted or lowered	3
Suffocation—smoke from boiler	2
Drilling machine	1
Contact with electric wire	1
Crushed between car and chute	1
Fall of coal	1
Total	35

A considerable increase occurred both in fatal and non-fatal accidents for 1902, the total number of fatalities being 47, or 3.41 per thousand men employed, and the non-fatal being 45. Silver Bow County shows a very high percentage for the year, its total being 34 fatal accidents, all other counties 13. A glance at the appended classified list of causes of accidents will show how varied the dangers which beset the life of the miner. It seems that death lurks even in the things which are designed as benefits. As instance, on August 24th, Craig Samples and George Whitcomb were working in an upraise in the Gilt Edge mine, Fergus county, and were operating a drill run by compressed air. Now compressed air is used for the double purpose of operating the machine and supplying ventilation to the men in that place. About 11 o'clock, of the morning of the above date, an explosion occcurred in the pipes connecting the air compressor and receiver, and in the receiver itself. The explosion generated a carbon dioxide or carbonic acid gas which was forced through the pipes under pressure, passed through the machine operated by Whitcomb and Samples, filling the place with the deadly gas and evidently before either of them could realize the danger or even notice the difference in the air. they were rendered unconscious and succumbed to its deadly effect. Besides these two men there were four other men engaged in running two machines at the same time, who were rendered unconscious through inhaling the gas conducted into their working places in the same manner, but happily they were discovered in time and were revived.

John Green, a hoisting engineer at the Gem Mine, Butte, climbed down the ladders into the mine on May 13th, for the purpose of informing the men below that he had pulled the cage into the sheaves and blocked it there, and to request them to assist him in releasing it. The shaft was quite warm, caused by the radiation from the steam pipes. He was later found dead, sitting on a platform on the 100 foot level.

The list of fatalities shows accidents resulting from causes which are both unlooked for and unexpected.

Summary of cause of accidents for 1902:

Explosion of blasting compounds	7
Falls of rock	16
Cages in shafts	5
Falling down shafts	3
Falling down ore chutes	3
Falling down manways	2
Suffocated by gas generated by explosion in air receiver	2
Suffocated, foul air	1
Material falling down shaft	2
Bursting water pipe	2
Running car in winze	1
Bucket falling down shaft	1
Struck by windlass arm	1
Died in shaft	1
Total	47

An analysis of the above summary reveals the fact that the most prolific source of accidents is falls of rock and caves of large masses of ground. The question of providing protection against falls of rock is a difficult one to meet. A great deal depends on the caution and judgment of the miner. It is impossible for the mine officials to visit every place in the mine at the same time. Several hours may elapse before all the working places are seen. In the meantime the miner should apply the first law of nature and protect himself by trimming down all the loose and shattered rock, and if necessary, put in timbers either temparory or permanent. The cost of timbering is one of the largest items which enters into mining. It therefore follows that the aim of the manager is to adopt that system which will entail least expense and provide safety. This means that more dependence must be placed on the ground to support itself. This tendency to shave down cost on material essential to safety in order to make favorable comparisons on the production cost sheet, requires to be continually combatted. Investigation of the mining accidents that have occurred during the past six years has proven to my satisfaction that of the many causes which contribute to accidents from falls of rock there are two which produce the great majority of them, viz: recklessness on the part of the miner and negligence on that of the manager.

I am pleased to report a very material decrease in the number of accidents caused by explosions, the number of fatalities from this source for the past two years being 10. Only one of this number was caused by the explosion of a thawing device, the other nine being attributable to causes that appear unavoidable.

Eight lives were lost by falling down shafts, manways and ore chutes. This is an unusually large number of casualties from these causes and is the best argument of the need for regulations which among others will provide for properly protecting such openings.

Cages and skips in various ways caused the death of ten men during the past two years, five each year. One of these accidents occurred recently, and the record would indicate that the engineer is chiefly responsible, as the accident occurred while four men were placing new guides in the shaft and had complete charge of the cage during the time they were so engaged. The accident resulted through the engineer's mistaking the signal of two bells, given to lower the cage, for three bells, given to hoist the cage, and started the cage for the surface, in doing which one of the men who was working on a platform on top of the cage was caught between the cage and shaft timbers and almost instantly crushed to death, while his partner received such severe injuries that his life is yet despaired of. The coroner's jury held no one responsible, presumably placing the blame on Providence. Several of the other fatalities from this cause are doubtless due to individual negligence, while from the record it would appear that the mining companies are responsible for the remainder.

The miscellaneous accidents which go to make up the total can hardly be considered as properly coming under the head of preventable accidents.

Defects in the Mining Inspection Law.

The prevalent opinion respecting the authority conferred on this department under the law creating the office and defining its duties, is very generally misunderstood, and as much so by that class who are directly affected by the work of the office, as any other. As a rule the average miner fancies that this law confers authority of a direct character on the Inspectors, or at least that it has enough force to enable them to enforce immediate compliance with orders or recommendations in cases where danger is imminent. If they would take the trouble to inform themselves as to how far the Inspectors may go in compelling the mine owner to adopt safer methods and in providing better general protection for their employees, there would be less disposition to criticise and the Inspectors would not so often be made to appear in a false light. But for that matter the law itself authorizes its executors to assume no other than a false attitude every time a visit of inspection is paid to a mine. The law creating this office of Inspector of Mines and defining his duties is embodied in sections 580 to 589 of the Political Code, inclusive. The sections detailing the duties of the office are sections 582 to 586, inclusive. The duties of the Inspectors are set forth in these sections specifically and in detail, but I have been unable to find where any provision was made granting authority in conjunction with the duties that would make their performance in any way effective.

Section 582 provides: "It is the duty of the Inspector of Mines by himself or deputy to visit every mine in the State once every six months and inspect its workings, timbering, ventilation, means of ingress and egress, and the means adopted and in use for the preservation of the lives and safety of the miners employed therein. For this purpose the Mining Inspector and his deputy shall at all times have access to any mine and all parts thereof. All mine owners, lessees, operators or superintendents must render such assistance as may be necessary to enable the Inspector or his deputy to make the inspection."

This section is all right as far as it goes. It was evidently intended to frame a reasonably strict mining law when this part of it was written. As it is, it has one merit, in that it grants the right to the Inspector and deputy to enter and examine a mine.

Section 583 provides: " That whenever the Inspector receives a complaint in writing signed and verified by the oath of three persons setting forth that the mine in which they are working is dangerous in any respect, he or the deputy must visit such mine. The complaint however must state specifically and in detail the nature of the danger existing and describe with as much certainty as possible how such mine is rendered dangerous, and set forth the time the cause of such danger was first discovered, and set forth whether or not any notice of such defect or danger has been given by the complainants or anyone else to their knowledge, to the superintendent of such mine, and if no such complaint has been made to such superintendent, the reason why it has not been made."

Section 584 provides that after such complaint has been received by the inspector, he must serve a copy thereof, but without the names of the complainants, upon the superintendent or manager or owner, at any time before he visits the same, and as soon as possible visit such mine.

The manner of procedure relative to the complaints as provided in section 583 and the part of 584 just quoted is unreasonable in its requirements for details and legal technique when applied to the average miner, and this office has not insisted on a strict conformity to minute details in complaints alleging the existence of dangerous conditions in a mine, the practice being to investigate complaints whether oral or written, made by one or a dozen persons and with or without oath, so long as we were reasonably satisfied that the complaint was made in good faith, it being our experience that it is safer to tolerate an occasional imposition rather than forego examining a mine because the complaint was not drawn up according to such exacting requirements, and afterwards discover that the abuses and conditions complained of were true.

The remainder of section 584 provides all the authority granted under the law for enforcing the recommendations of the Inspector of Mines, and is as follows:

"And if from such examination the Inspector ascertains that the mine is, from any cause, in a dangerous condition, he must at once notify the owner, lessor, lessee, or agent thereof, such notice to be in writing, and to be served by copy on such owner, lessor, lessee, or agent, and the notice must state fully and in detail in what particular manner such mine is dangerous or insecure, and require all necessary changes to be made without delay, for the purpose of making such mine safe for the laborers employed therein; and in case of any civil or criminal procedure at law against the party or parties so notified, on account of loss of life or bodily injury sustained by any employee subsequent to such notice, and in consequence of a neglect to obey the inspector's requirements, a certified copy of the notice served by the inspector is prima facie evidence of the gross negligence of the parties so complained of."

Section 585. "It is the duty of the mine inspector at least once a year, either in person or by a deputy inspector, to visit each mining county in the State, and examine as many of the mines in the different counties as practicable, and make such recommendations as in his judgment are necessary to insure the safety of the workmen employed therein And whenever from his examination, he finds any mine to be in an unsafe condition, he shall at once serve a notice upon the owner, lessor, lessee, or agent thereof, as provided in the next preceding section.

The authority vested under the law, (stripped of its legal verbiage) in the office of the Inspector of Mines is that the inspectors are granted the right to inspect mines and are required to do so, examine carefully the workings, timbering, ventilation, means of ingress and egress, and investigate and inquire thoroughly into the means, methods and practices adopted and in force for the general preservation of the lives, safety and health of the miners employed, and if the workings in any mine are found to be dangerous or insecure from any cause, or a place is found to be badly ventilated, or the machinery, cable, bucket, skip, etc., are discovered to be weak and defective, or that the lives and safety of the men are not considered in the system adopted, the inspector or his deputy has the authority to serve a notice on the person in charge of such mine, recommending that the particular cause of danger be looked after and remedied without delay, and when this notice is served the full authority of the office, insofar as its ability to remedy bad mine conditions is concerned, is exhausted, as the law fails to make any provision for enforcing its recommendations. Regarding the last paragraph of section 584, which provides that in case of a civil or criminal procedure at law on account of the death or bodily injury of an employee and in consequence of a neglect to obey a recommendation of the inspector, that a copy of such recommendation is prima facie evidence of the gross negligence of such mine owner, it is, to say the least, heartless in its terms when applied to a human being. To think that the law protects the mine owner in the right to expose his employees to dangers which constantly threaten their lives, after such dangers have been pointed out and official warning served on him, is to imagine a government that holds human life as its cheapest possession. But such is the law. The miner must be killed or receive great bodily injury before any redress can be sought, and then redress can only be obtained through a suit for damages, and actions for damages for loss of life and serious injuries through mine accidents have not resulted so favorably to the plaintiffs as to cause any special effort to be made to avoid their recurrence.

Section 586 in brief provides that whenever a serious or fatal accident occurs in any mine it is the duty of the person in charge to notify the inspector or deputy inspector. If possible one of them must proceed to the place and investigate fully the cause of such accident, and, whenever possible, appear before the coroner's inquest and testify as to whether in his opinion the accident was due to the negligence or mismanagement of the owner or person in charge. The inspector's duty seems to end there. It matters not that the inspector might find a condition that would indicate plainly the responsibility of the management, the coroner's jury makes its own verdict, and usually insists on blaming Providence, by deciding that the accident was purely unavoidable, regardless of any evidence offered to the contrary. This section is so clear that further comment is uncalled for. Under it the inspectors are obliged to investigate and testify and if the place where the victim met death is found to be in a dangerous condition, a notice to that effect may be served on the person in charge.

It must not be understood from the comments made on the law in the foregoing that all of the mine owners and mine managers in the State are heartless and indifferent to the safety and welfare of their employees. On the contrary there is, I am pleased here to acknowledge, a very considerable number of them who are as solicitous for the safety, health and general welfare of their employees as the most exacting requirement would demand. They feel a personal responsibility for those under their charge and realize that their lives in a large measure are dependent on the precautionary measures adopted in their interests. When an accident occurs in a mine managed by any of these men, there is no attempt made to shift the responsibility onto some minor official or to evade the most searching inquiry. Ignorance of the conditions existing in the place where the accident occurred is not offered, nor is the Shift Boss blamed for not anticipating what his superior would have done had he knowledge of the conditions. Mine managers of this class operate the properties in their charge in accordance with a regulated and organized system, and when an accident occurs are much more concerned in learning the cause and arriving at the true facts than the average coroner's jury. They want to ascertain if the positive orders issued by them are being obeyed, or if there is any departure from the system adopted for carrying on the operations of the mine in its various divisions, and if so, to what extent practices representing individual views have crept in and how much are they responsible for the accident. And be it understood again that of the motives which actuate the class of mining men referred to in making such searching inquiries, philanthropy is the least. The prime motives are discipline, order, system, all ending in economy of management.

Four special legislative acts practically constitute the laws that are effective in operation and can be enforced by this department. Proper penalties are provided for their violation, by which means at least three of them to a large extent enforce their own provisions. Each one of these laws provides against a different class of accidents and furnishes protection against perilous situations of a kind that, prior to their enactment, claimed many victims. These laws are, House Bill 17, Session laws of 1897, which provides for a second and independent outlet for escapement purposes in all mines worked through a vertical or inclined shaft. Section 705 of the Penal Code, as amended by House Bill 77, Session laws of 1897, provides for the use of an iron bonneted cage, equipped with safety clutches and doors or gates in all vertical shafts after a depth of three hundred feet has been attained.

Sections 3652, 3653, and 3654 of the Political Code, provide for a uniform code of mine signals to be used to the exclusion of all others in lowering and hoisting through shafts in this State.

Sections 708, 710, 714, and 715 of the Penal Code, provide for the storage of explosives in mines.

As will be readily observed each of these laws is designed to meet a condition which, if left unregulated, would be the cause of many accidents.

Recommendations.

The following recommendations are submitted for consideration in the firm belief that if enacted into law a material decrease in the per cent of mine accidents will result therefrom.

Amending section 583 of the Political Code, providing that the Inspector of Mines on receipt of verified complaint from any one person, stating that the mine in which he works is dangerous from any cause, must as soon as possible after receipt of same visit such mine and make a thorough examination thereof, and such notice need only state the name of the mine and the place where such danger exists.

Amending section 583 of the Political Code, by striking out the clause requiring the Inspector of Mines to serve a copy of complaint received by him on the manager, superintendent, etc., of any mine complained of. Providing that where such a mine is found dangerous on examination, the Inspector shall serve a notice requiring that all changes, repairs, and alterations, whether in the mine or to the machinery and appliances, be made within a time specified, and providing that if the Inspector's requirements are disregarded then he shall have the right to forbid working the part of the mine where such danger exists, excepting in making repairs and putting it in safe condition, and providing that the Inspector shall have the authority to cause the arrest and prosecute on a charge of gross negligence, the owner, lessor, lessee or agent of such mine.

Amending section 585 of the Political Code, providing that, when unsafe conditions are found by the Inspector or deputy inspector in the course of official visits of inspection to the mines of this State, a notice shall be served and the same procedure govern as provided in section 584. Amending section 586 of the Political Code, by providing that the Inspectors after investigating into the cause of a fatal accident or serious injury may, if they deem the facts warrant it, prosecute for gross or criminal negligence the owner, lessor, lessee or agent of the mine in which such accident occurred.

That part of section 705 which provides that cages shall be equipped with doors or gates for the purpose of affording protection to men while riding through shafts, has been notably beneficial to those working at great depths, and I would earnestly oppose any change in the law which, in my opinion, would weaken its main purpose or lessen its beneficial features in the slightest. Experience gained with the operation of this law since its enactment, has demonstrated the need of amendment in two particulars. First, the great inconvenience experienced in loading the car in the bottom of a shaft during the progress of sinking. When the cage is built and equipped according to the requirements of the law, practically prohibits its use for that purpose, and as for the men employed in the sinking, instead of using the gates, they denounce them as being impractical in that kind of work. The cage tenders, who are intrusted with full charge of the cages on their respective shifts, give all signals to the engineer, load and unload all cages and are continually changing from one level to another in the performance of the innumerable duties they are called upon to discharge, seldom or never use the gates for themselves, the very nature of their duties making them inconvenient, and familiarity with the cages produce a disdain for such devices which no order or instructions to the contrary will make them obey. The law, after a long and severe trial, has proven a failure in these two particulars, despite the best efforts of this department to enforce it in its entirety. Aside from these two instances it has been complied with, and absolute compliance has been insisted on when the shifts were being lowered into or hoisted out of the mine.

It is therefore deemed advisable to recommend that this law be amended so as to exempt cages actually engaged in sinking from the use of doors or gates, and excepting cage tenders from the same requirement of the law.

Limiting the rate of speed at which employees are lowered into or hoisted out of shafts, allowing it not to exceed eight hundred (800), feet per minute, and providing a severe penalty for the violation thereof.

Prohibiting, under severe penalty, stoping up to a shaft, and providing for a pillar to be left that will ensure the safety of the shaft.

Providing that the provisions of House Bill, No. 17, session laws 1897, which provide for a second, or escapement outlet in mines worked through vertical or incline shafts, be made to apply to mines worked through tunnel openings.

Providing that all owners, lessors, lessees, agents and managers operating any metelliferous mine in which five or more men are employed shall report same to the Inspector of Mines.

Providing suitable penalties for the violation of all laws relating to the office of Inspector of Mines.

During the years 1901 and 1902, notices recommending the following were issued and generally complied with.

Regarding timbers and timbering	19
Regarding place of storing explosives	11
Regarding amount of explosives in magazines	3
Storing oil and inflammable material in shaft houses and buildings covering mouth of tunnel	8
Regarding apparatus for thawing	38
Employment of cage tender with full charge of cage	2
Defective safety clutches on cages	3
Regarding defective hoisting cable	4
Regarding escapement shaft	9
Regulating number that may ride on skips and cages	5
Forbidding riding upon loaded cages, skips or buckets	9
Regarding use of State Code of Mine Signals	3
Regarding use of gates on cages when sinking	12
Providing better ventilation	14
Providing tunnel opening with separate connections to surface for escapement	7
Leaving pillar of ground to protect shaft	5
Regulating rate of speed in lowering and hoisting men	3
Repairing and putting in new ladders	34
Regarding cross heads	15
Provide railings around shafts, winzes and man-ways	11
Requiring finger boards	17

TOTAL PRODUCTION OF PRECIOUS METALS IN MONTANA DURING THE CALENDAR YEAR 1900.

Compiled from report of Mr. B. H. Tatem, Assayer in Charge U. S. Assay Office.

Description.	Quantity.	Value.
Gold, fine ounces	229,114.882	$4,736,224 95
Silver, fine ounces, (coining value)	14,294,835.11	18,482,211 05
Copper, fine pounds, at $16.19 per cwt	245,998,365	39,827,135 29
Lead, fine pounds, at $4.37 per cwt	16,044,751	701,155 62
Total		$63,746,726 91

COMPARATIVE STATEMENT OF PRODUCTION OF PRECIOUS METALS IN MONTANA FOR THE YEARS 1899 AND 1900.

METALS	1899		1900		
	Quantity	Value	Quantity	Value	Decrease
Gold, fine ounces	233,126.717	$4,819,156.95	229,114.882	$4,736,224 95	$82,932 00
Silver fine ounces	*16,850,754.85	21.786,834.52	14,294,835.11	18,482,211 05	3,304,623 47
Copper, fine lbs..	245,602,314	40,941,905.74	245,998,365	39,927,135 29	1,114,770 45
Lead, fine lbs	20,344,750	909,410.33	16,044,751	701,155 62	208,254 71
Total		$68,457,307.54		$63,746,726 91	$4,710,580 63

* Coinage value.

TOTAL PRODUCTION OF PRECIOUS METALS IN MONTANA DURING THE CALENDAR YEAR 1901.

Compiled from report of Mr. B. H. Tatem, Assayer in Charge U. S. Office.

Description.	Quantity.	Value.
Gold, fine ounces	232,331.454	$4,802,717 39
Silver, fine ounces, (coining rate)	14,180,545.19	18,334,442 26
Copper, fine pounds, at $16.117 per cwt	228,031,503	36,751,837 34
Lead, fine pounds, at $4.334 per cwt	11,504,892	498,622 02
Total		$60,387,619 01

COMPARATIVE STATEMENT OF PRODUCTION OF PRECIOUS METALS IN MONTANA FOR YEARS 1900 AND 1901.

METALS	1900		1901		Increase or Decrease
	Quantity	Value	Quantity	Value	
Gold, fine ounces	229,114.882	$4,736,224.95	232,331.454	**4,802,717 39	$66,492 44
Silver, fine ounces ***	14,294,835.11	18,482,211.05	14,180,545.19	*18,334,442 26	147,768 79
Copper, fine lbs	245,998,365	39,827,135.29	228,031,503	*36,751,837 34	3,075,297 95
Lead, fine lbs	16,044,751	701,155.62	11,504,892	*498,622 02	202.533 60
Total	....	$63,746,726.91	....	*60,387,619 01	$3,359,107 90

*** Coining value. ** Increase. * Decrease.

PRODUCTION OF GOLD, SILVER, COPPER AND LEAD IN THE STATE OF MONTANA FROM THE YEAR 1862 TO 1901, INCLUSIVE.

YEAR	Gold	Silver*	Copper	Lead	Totals	Yearly Increase Per Cent
1862 to 1881, inc.***	$200,000,000	$11,000,000	....	....	$211,000,000	....
1882	2,550,000	4,370,000	$1.539,860	....	8,459,860	....
1883	1,800,000	6,000,000	3,452,960	$226,424	11,479,384	37½
1884	2,170,000	7,000,000	5,386,500	246,326	14,802,826	31
1885	3,466,000	11,500,000	6,779,800	274,350	21,954,150	50
1886	4,422,000	13,849,000	5,761,200	494,132	24,526,332	12
1887	5,978,536	17,817,548	8,853,750	607,662	33,257,496	35½
1888	4,200,253	15,790,736	15,103,946	569,160	35,664,095	7½
1889	3,500,000	19,393,939	13,334,970	456,975	36,685,384	3
1890	3,300,000	20,363,636	16,656,437	675,392	40,995,465	11½
1891	3,890,000	20,139,394	14,377,336	1,229,027	38,633,757	5½
1892	2,891,386	22,432,323	19,105,464	990,035	45,419,208	18
1893	3,576,000	21,858,780	16,630,958	964,089	43,029,827	5**
1894	3,651,410	16,575,458	17,233,718	730,551	38,191.137	11**
1895	4,327,040	22,886,992	21,114,869	754,360	49,083,261	28½
1896	4,380,671	20,324,877	25,356,541	670,010	50,732,099	3½
1897	4,496,431	21,730,710	26,798,915	928,619	53,954,675	6
1898	5,247,913	19,159,482	26,102,616	809,056	51,319,067	5**
1899	4,819,157	21,786,835	40.941,906	909,410	68,457.308	33
1900	4,736,225	18,482,211	39,827,135	701,156	63,746,727	7**
1901	4,802,717	18,334,443	36,751,837	498,622	60,387,619	5**
Total	$277,139,739	$350,795,364	$361,110,718	$12,735,356	$1,001,782,177	

* Coinage value. *** No annual compilations were made prior to 1881.
** Decrease.

PRODUCTION OF BRICK AND CLAY FOR CALENDAR YEAR 1900.

Brick, common	35,194,000	$201,570 00
Brick, front	185,000	3,320 00
Brick, fire, alumina	1,840,000......	61,900 00
Brick, fire, silica	836,000	28,610 00
Brick, paving	53,000........	795 00
Sewer pipe and drain tile	28,000 feet	5,800 00
Fire clay	6,820 tons	6,820 00
Other clay manufactures	402,000 tons	4,895 00
Total ,value	....	$313,710 00

PRODUCTION OF BRICK AND CLAY FOR CALENDAR YEAR 1901.

Brick, common	43,053,500	$287,237 00
Brick, front	582,000	9,025 00
Brick, fire, alumina	2,582,000	110,368 00
Brick, fire, silica	235,000	10,330 00
Brick, paving	110,000	1,100 00
Sewer pipe and drain tile	10,000 feet	2,000 00
Fire clay	4,310 tons	17,482 00
Other clay manufactures	3,703 tons	21,018 00
Total value		$458,560 00

PRODUCTION OF STONE YEAR 1900.

Granite, building	1,627,933 cubic feet	$65,449 00
Limestone flux	273,373 tons	130,393 00
Sandstone, building	448,621 cubic feet	40,218 00
Total value		$236,050 00

PRODUCTION OF STONE, YEAR 1901.

Granite, building	581,478 cubic feet	$63,946 00
Granite, monumental	4,050 cubic feet	3,050 00
Limestone flux	205,300 tons	135,900 00
Limestone, building	13,450 cubuc feet	7,700 00
Sandstone, building	217,649 cubic feet	68,827 00
Standstone, flagging	4,000 cubic feet	8,000 00
Total value		$287,423 00

OPERATING MINES IN MONTANA HAVING A DEPTH OF 500 FEET OR MORE.

Name of Mine.	Depth.	Name of Mine.	Depth.
Anaconda	1,800	Lexington	1,500
St. Lawrence	1,885	Blue Jay	1,075
Never Sweat	2,000	Berkeley	900
High Ore	2,200	Colusa-Parrot	1,400
Bell	1,800	East Stewart	1,300
Diamond	2,200	West Stewart	1,100
Green Mountain	2,200	Original	1,400
Mountain Con. No. 1	2,200	Rarus	1,300
Mountain Con. No. 2	1,500	Nipper	800
Buffalo	1,600	Minnie Healey	800
Little Minah	800	Alice	1,500
Parrot	1,600	Blue Wing	650
Moonlight	1,300	Magna Charta	700
Pennsylvania	1,500	Ella	500
Mountain View	1,800	Speculator	1,400
Leonard	1,200	Drum Lummon	1,600
West Colusa.	1,400	Mayflower	1,200
East Colusa	900	Kennet	600
Gagnon	1,800	Granite	1,600
Silver Bow No. 1	1,000	Bi-Metallic	1,800
Silver Bow No. 2	700	Hope	550
East Grey Rock	700	North Pacific	650
West Cora	900	Eva May	600
East Cora	1,500	Atlantis	800
Farrel No. 2	800	Cleve	1,000
Anna	800	Watseca No. 2	650
Gem	700	Bowery	550

Prior to 1901 the coal miners were included in the aggregate number of men employed in the mines of the state, as they all came under the jurisdiction of this department. Since the creation of the Coal Mine Inspection Department the coal miners have been omitted from the following table, which accounts for the apparent decrease shown in the number of men employed. In reality, as shown by this table, there has been a very material increase in the number of men employed in the mines of the state.

The following exhibits the number of mines inspected, the number of men employed and the number of fatal and non-fatal accidents in the metalliferous mines during the past ten years.

YEAR	Mines Inspected	Men Employed	Fatal Accidents	Non-Fatal Accidents	Total Accidents	No. of Fatal Accidents per 1,000 Men Employed
1893	56	5,312	29	4	33	5.45
1894	78	7,082	27	19	46	3.81
1895	88	8,758	41	18	59	4.67
1896	78	7,727	64	21	85	8.28
1897	130	9,825	52	29	81	5.29
1898	136	11,096	48	29	77	4.32
1899	165	12,316	49	22	71	3.97
1900	163	13,996	47	35	82	3.36
1901	157	12,078	35	33	68	3.00
1902	169	13,784	47	45	92	3.41

To the number of men employed we may conservatively add 850 who are scattered prospecting and working their own claims with from two to five men, and as lessees, making a grand total of men employed for 1902 of 14,634.

The following brief outline of the geological and physical feature of the Butte Mining District is intended to give in more detail information pertaining to the Butte District, which has been requested through correspondence from time to time by many persons.

GEOGRAPHY, HISTORY, PRODUCTION, FISSURE SYSTEMS. DISTRIBUTION OF ORES, CHARACTER OF ORES.

Geography.

The Butte Mining District, as operated today, covers an area of approximately four by six miles, or twenty-four square miles.

It is included between 45 deg, 39 min., 30 sec. and 46 deg. 2 min. 50 sec. north latitude, and 112 deg., 29 min. by 112 deg, 36 min. longitude west of Greenwich.

To one conversant with the district, it presents strikingly contrasting features when compared with the adjoining or encircling country. It is a most prodigious—one might say—bluff, on the main divide of the Rocky Mountains, rising above the gently moulded and round topped hills of Butte proper, a distance of 2000 feet. To the north the distinguishing characteristic is the chopped, illy defined nature of the country. while to the west rise the timbered rhyolite slopes with their striking colors, whereas to the south in general there is a great flat or regular basin which has been filled by deposits of various descriptions. Butte itself presents a general barren aspect, which results naturally through the ready disintegration of the surface rocks and the devastating effects of the smelter smoke.

The granite in the semi-composed state forms sand or gravel rather than earthy material capable of supporting vegetable life. The smelter fumes contain arsenical and sulphurous gases, which destroy even the vegetation artificially started by the residents of Butte, unless constantly cared for.

Another noticeable feature of Butte which tends to draw from its productiveness, is the utter lack of water in the district. Silver Bow Creek is a comparatively small sized stream, loaded beyond its carrying capacity with the refuse of tailings from the ore reduction plants. Its present size is greatly increased through the bringing, for the use of the city and reduction works, of large amounts of water from distant points. Most notable among these is the Butte City Water Company supply, being two principal sources of supply, one of which is upon the Atlantic slope, or across the range from Butte. The principal supply now comes from the Big Hole River and is carried a distance of nearly forty miles in pipes.

The district might be further described as divided into a copper and silver region or belts. The Butte mountain, or Anaconda Hill, as it is sometimes called, is the center of the copper zone and occupies six or eight square miles of the total district. The silver belt, which embraces the country to the northwest and south of the copper belt or zone, is usually marked by the constant appearance of black oxide of manganese on the surface exposures of the veins—this in sharp contrast with the copper vein croppings, which are simple exposures of soft, porous, iron stained quartz.

History.

The original prospectors of Butte happened to stop on what is now known as Missoula Gulch, a small but well marked tributary of Silver Bow Creek, and there found rich gold deposits. This was in the year 1864. The limited amount of water available made the placer season extremely short, and owing to the lay of the land about Butte available water of any sufficient quantity for placer operations could only be brought to Missoula Gulch at very great expense and upon the construction of thousands of feet of flume and miles of expensive ditches. For this reason and partly because of the very conspicuous nature of the silver vein croppings, the placer miner gave his attention shortly to underground explorations, some prospectors choosing the black, strongly defined croppings on the silver vein and some the scarcely noticeable, rusty quartz croppings, which as we know today, represented the tops or apices of the copper veins.

The first rich silver ore was discovered in the year 1875 in the Travonia. Ore was shipped from this property and from other discoveries made at about the same time, to the smelters at Salt Lake—the fact which I presume accounts for the early purchase of the Alice mine, at the head of Missoula Gulch, by the Walker Brothers, of Salt Lake City, in 1877. This property has been worked continuously from that day until this and gives promise of being a producer for years and years to come, the only question which will control the output of the property being the price of silver.

The next most noticeable property developed was the group of claims now known as the Lexington mine. This is just south of the Alice but north of the great copper zone.

Following this came the organization of the Moulton Mining Company, operating on the western continuation of the Alice veins. Later, the Blue Bird Company, in the southwestern part of the district, and the Nettie group of claims, owned and operated by the Colorado Smelting and Mining Company. There were many smaller companies and many single properties operated by individuals, all of which operated with considerable regularity down to the year 1893. At the present time, however, the Alice and the Lexington are the only companies engaged in steady operation. It is possible that mention should be made, however, of the fact that small pockets and chutes of ore accidentally left in the mines by the large companies when operating, are now being removed by lessees, most of whom were former employees in the particular mines which they are now leasing and whose intimate knowledge of the ores they were mining now serve them in their capacity as lessees.

The ores from the Lexington, Alice and the Moulton properties, were reduced by the so-called dry chlorination process, consisting in dry crushing by stamps, roasting with salt and pan amalgamation. On the Lexington a 70-stamp mill was constructed; on the Alice a 60-stamp mill; on the Moulton a 40-stamp mill; and on the Blue Bird a 90-stamp mill. The only mill in operation today is the Alice.

The first copper ore was taken from what is now known as the Parrot, but proved entirely unprofitable until the year 1879-80, when the Colorado Smelting Company erected their plant for making copper matte or regulus. The success of this plant caused the immediate construction of the Parrot and the Colusa smelters the following years, these operating on the ores of the Parrot and the Colusa mines and prospects on the Anaconda lode. In 1881 the first railroad reached the district. The expense of building a large portion of the Utah and Northern route, now a link in the Oregon Short Line-Union Pacific System, from Silver Bow by Butte, was borne by the citizens of Butte.

The growth of the copper industry, and in consequence of this, of the city of Butte and its suburbs, has been steady, healthy and rapid since, until today the population of Butte and its suburbs is close to 60,000 inhabitants. The ores in Butte are treated at the Colorado, the Butte and Boston, the Montana Ore Purchasing Company, and the Butte Reduction Works in Butte, the Boston and Montana works at Great Falls, Montana, and the Washoe Company, wing of the Amalgamated Copper Company, at Anaconda, Montana; in all capable of handling from twelve to fifteen thousand tons or ore per day.

Geology.

The geological aspects of Butte may be divided into two bases of discussion. (1st) The rock formations or occurrences there appearing, and (2nd) the fissure systems. Another mode of division would be the geological aspects of the silver veins and the geological aspects of the copper veins; but as the silver and the copper veins occur in the same geological rocks and in the same fissure systems, the more intelligent and preferable division is, I believe, that first given.

The rocks of Butte consist of granite, aplite, quartz porphyry and rhyolite. The rhyolite is more recent than the other rocks and than the ore deposits. Its occurrence is a detriment, one might say, to the district. It is largely confined to the northwest portion and cuts in like a knee to the general symmetry of the ore deposits of the district. The granite is a part of the great mass extending from the vicinity of Helena on the north to the Elkhorns on the east, the Highlands on the south, and Anaconda and Philipsburg on the west, making an area of several hundred square miles. It is, by far, the predominant rock of the district. Locally, and especially in the western portion of the Butte Mining District proper, aplite, which is in reality only a phase of granite, having less of the basic constituents, hornblend and mica, seems to predominate. This, however, is only a surface phenomenon, the aplite in reality occurring in sheets and sills, or, in the language of the prospector, in dikes and beds. The quartz porphyry is the least noticeable of all the rocks of the district, there being, so far as known, but three or four small dikes in the eastern and central parts of the district.

According to the chemical analysis of the Butte granite, made by the United States Geological Survey, and published in their report on the district, the granite is shown to be of a rather basic type. As published in their folio, the percentages of essential constituents are as follows:

SiO_2	63.88	to	64.34
Al_2O	15.38	to	15.84
FeO Fe_2O_3	4.5	to	4.7
CaO	3.97	to	4.3
MgO	2.08	to	2.23
K_2O	4.0	to	4.23
Na_2O	2.74	to	2.81

The rock is so basic that it may be said to be almost dioritic in composition. In fact, were it not for the quartz present, it might be classified as a diorite. This is mentioned at some length, owing to the fact that the basic nature of the granite has been claimed by geologists and mining engineers to be the primary factor in the excessive precipitation and formation of the ore bodies at Butte.

The Fissure Systems and Description of Ores.

Owing to the extensive litigation at Butte, one is greatly handicapped in publishing data in a report of this description, because of the official nature of the report and a possibly mistaken value which might be placed upon it. In general it should be said that the main fissure systems of the Butte camp are easterly and westerly. This is true of both the silver and the copper veins. So far, indeed, as observation can be made, there appears to be a common age for the fissure systems, which is prior to the mineralization; that is to say, that the silver veins and the copper veins occur in fissures of the same age. In fact, it is well known that many of the copper veins have been followed along in strike until they were practically silver veins, and vice versa.

In addition to the main system of east and west fissures there are north 70 deg. west and north 70 deg. east, in abundance, and northeast and northwest fissures occasionally. In some of the minor veins, these intersecting fissures become of great importance, because their influence upon the mineralization of the main east and west ore channels is very great. This, indeed, has been the great lesson of the recent development work in the Butte District. No fissure, indeed, has come to be despised in its relations with the other fissures of the mine or of the district.

Another important feature of the Butte camp is the close interspacing of many fissures having the same direction. It is probable that the close interspacing of parallel fissures is responsible for the intense mineralization and the great width or size of many of the ore bodies at Butte.

The ore values may be said, in general, to occur in distinct fissure veins, as portions of a vein filling, or as replacements of portions of the country rock, whether it be granite, aplite or quartz porphyry. In general, as well, it should be stated that the vein mineralizations of importance are chalcocite, enargite, bornite, pyrite, quartz, galena, sphalerite, rhodonite and rhodochrosite, together with some forms of gold and silver minerals, and the oxidation products of the sulphides and carbonates. All of these minerals are common to the copper veins, except rhodochrosite and rhodonite. All are common to the silver veins except chalcocite and enargite, and here lies the greatest mineralogical difference and distinguishing features between the two tpyes of veins—the silver vein, with its pink manganeses, and the copper vein, with its black chalcocites and enargites.

The lateral distribution of ore in the veins is marked, thus far, only by the extent of the prospecting, ore having been found to the east as far as prospected and to the west as far as prospected and to the deep as far as prospected. It must not, however, be understood by this statement, that the ore is of uniform value or size wherever prospected. As a matter of fact, it varies from a few inches to a few hundred feet in width; and to the east as well as to the west the ore bodies thus far encountered have been found, in the majority of cases, altogether too small to be of commercial value. In some cases, the veins have been strong and healthy, but quartz has been the predominant mineral. Therefore it has not been possible, with present prices and processes, to work the ore at a profit.

The production from the Butte district is generally estimated to have been about $500,000,000 to date and ranges from $40,000,000 to $50,000,000 per year in copper, silver and gold. The average of the low grade copper ores worked ranges from 3 per cent to 5 per cent copper, with a small value in gold. This quality of ore is concentrated by the ordinary wet process, from three to four tons of crude ore being required to produce one ton of concentrates, which have a value ranging from 10 per cent to 15 per cent copper. The so-called high grade ore is smelted direct and ranges from 10 per cent to 20 per cent, which is smelted in either blast or reverberatory furnaces to a matte, running 54 per cent copper, which is in turn treated in the converters, reducing it to black copper having a value of 98 1-2 to 99 1-2 per cent fine copper, carrying gold and silver.

The Amalgamated Company has large and complete electrolytic plants at Anaconda and Great Falls, where the copper, gold and sillver is recovered in a state of purity and ready for the market. Other producers do their refining in the eastern states.

The Butte district is one of the largest and best ordered mining districts in the world. While every form of labor is represented by its union, there has been comparatively little friction between employer and employee and the various questions arising regarding wages, hours, etc., have heretofore been adjusted by discussion and agreements. While wages are high, the quality of service rendered is correspondingly high, as evidenced by the fact that while Butte produces a low grade ore (it yields a large increment of profit to its mine owners and successfully competes with the whole world in the production of copper. The managers of the various mine enterprises and the business men of Butte are strong, capable and enterprising, as evidenced by the high order of civilization that has resulted from their labors. The city is healthfully situated on a hillside and is well equipped with everything that contributes to health, comfort and happiness, to be found in any city in the United States with a population of 100,000 people.

The school system is in every respect first class. The schoolhouses are models in modern school architecture. There is also located here the State School of Mines, which is doing splendid work in educating the youth of Montana in the science and practice of modern mining and ore reduction.

The churches are all well represented and attended and comfortable church buildings are to be found in all parts of the city.

The city and county governments are both capable and efficient, as evidenced by the good order, health and happiness of the people.

The enormous business created by the mines and reduction works has resulted in ample railway facilities, furnished by the Great Northern, Union Pacific and Northern Pacific systems, connecting with all points east, west, north and south.

SILVER BOW COUNTY.

COMPARTIVE STATEMENT OF THE PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

DESCRIPTION	1900	
	Quantity	Value
Gold, fine ounces	54,552.115	$1,127,692 30
Silver, fine ounces*	9,454,279.36	12,223,714 73
Copper, fine lbs.	245,783,551	39,792,356 90
Lead, fine lbs	211,971	9,263 13
Total values	....	$53,153,027 06

* Coinage value.

DESCRIPTION	1901		Increase or Decrease
	Quantity	Value	
Gold, fine ounces	47,132.745	$974,320 31	***$153,371 99
Silver, fine ounces*	9,638,071.42	12,461,344 86	**237,630 13
Copper, fine lbs	227,742,262	36,052,220 37	***3,740,136 53
Lead, fine lbs	138,846	6.017 59	***3,245 54
Total values	....	$49,493,903 13	***$3,659,123 93

* Coining value. ** Increase. *** Decrease.

Butte, Montana, Dec. 1, 1902.

Mr. John Byrne,
State Mine Inspector, Helena, Montana:

Dear Sir:—I herewith submit for your approval my annual report of mines examined, list of accidents, fatal and non-fatal, during the year ending Nov. 30, 1902, I remain,

Very respectfully,
JOHN J. BARRY,
State Deputy Inspector of Mines.

Report of the State Deputy Mine Inspector

During the year just coming to a close mining operations in Butte, and Silver Bow County, have run along with their accustomed regularity. The total tonnage of ore extracted has continued the same as in the previous year. Extensive improvements have been made by the larger corporations in the equipment of their surface plants, steel gallows-frames now adorn all the principal shafts, taking the places of former frame shaft-houses which proved dangerous in case of fire. These modern gallows-frames have also been placed in position with a view of deeper mining.

While the development of the mines of Butte in this respect has been going steadily on, the coming year will witness the beginning of the era of deep mining in Butte. Several of the larger mines will have much deeper shafts before another twelve months roll around.

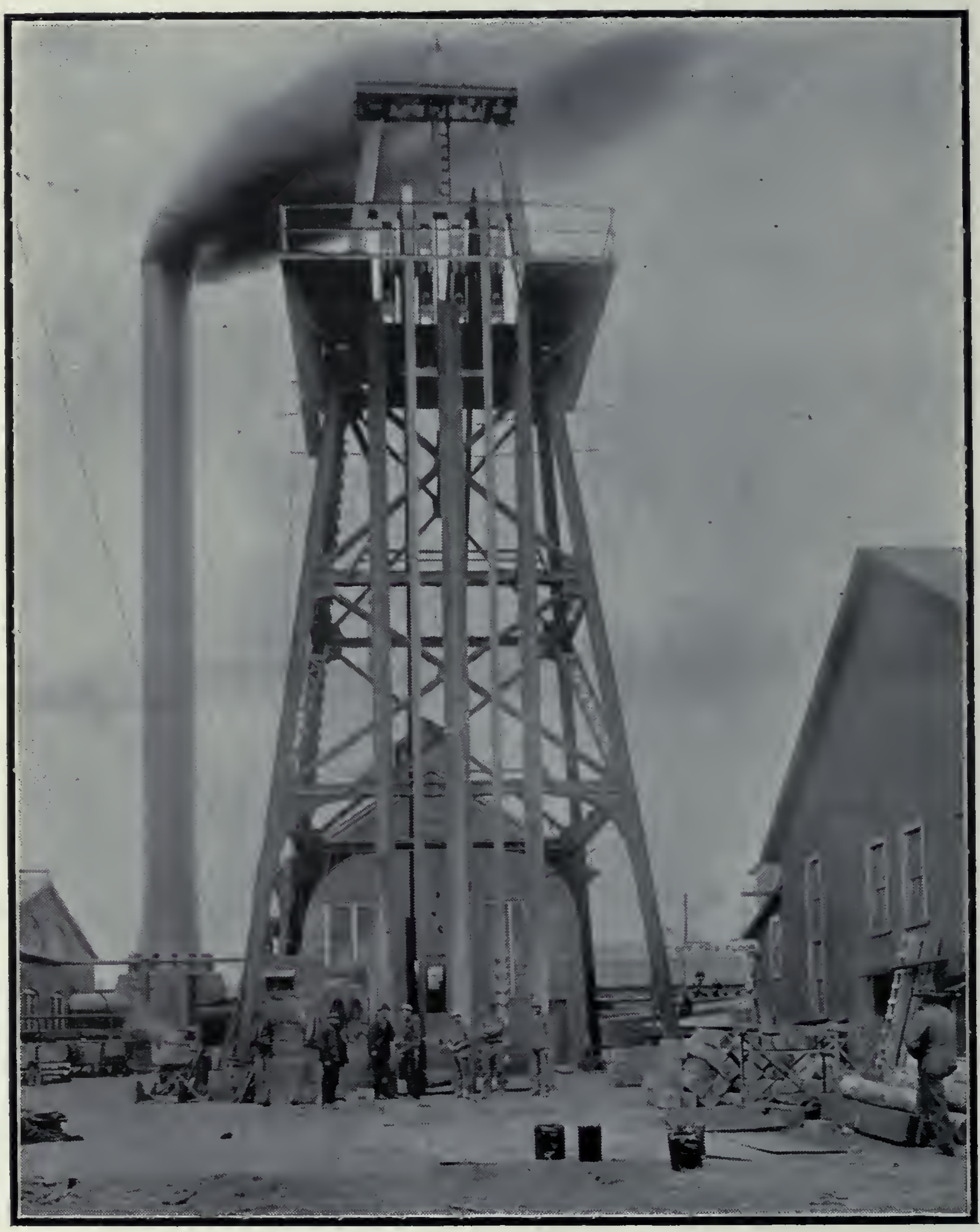
Since the completion of the new Washoe Smelter near Anaconda, the old smelting works of the Anaconda Company have been abandoned. The new plant is operating very successfully. The Butte Reduction Works, Colorado Smelter, and the Butte & Boston smelter have operated almost continuously during the year. Fire destroyed the Montana Ore Purchasing Company's concentrator and the company is now doing its concentrating at Basin. The Boston & Montana product is treated as usual at Great Falls.

The Anaconda Copper Mining Company.

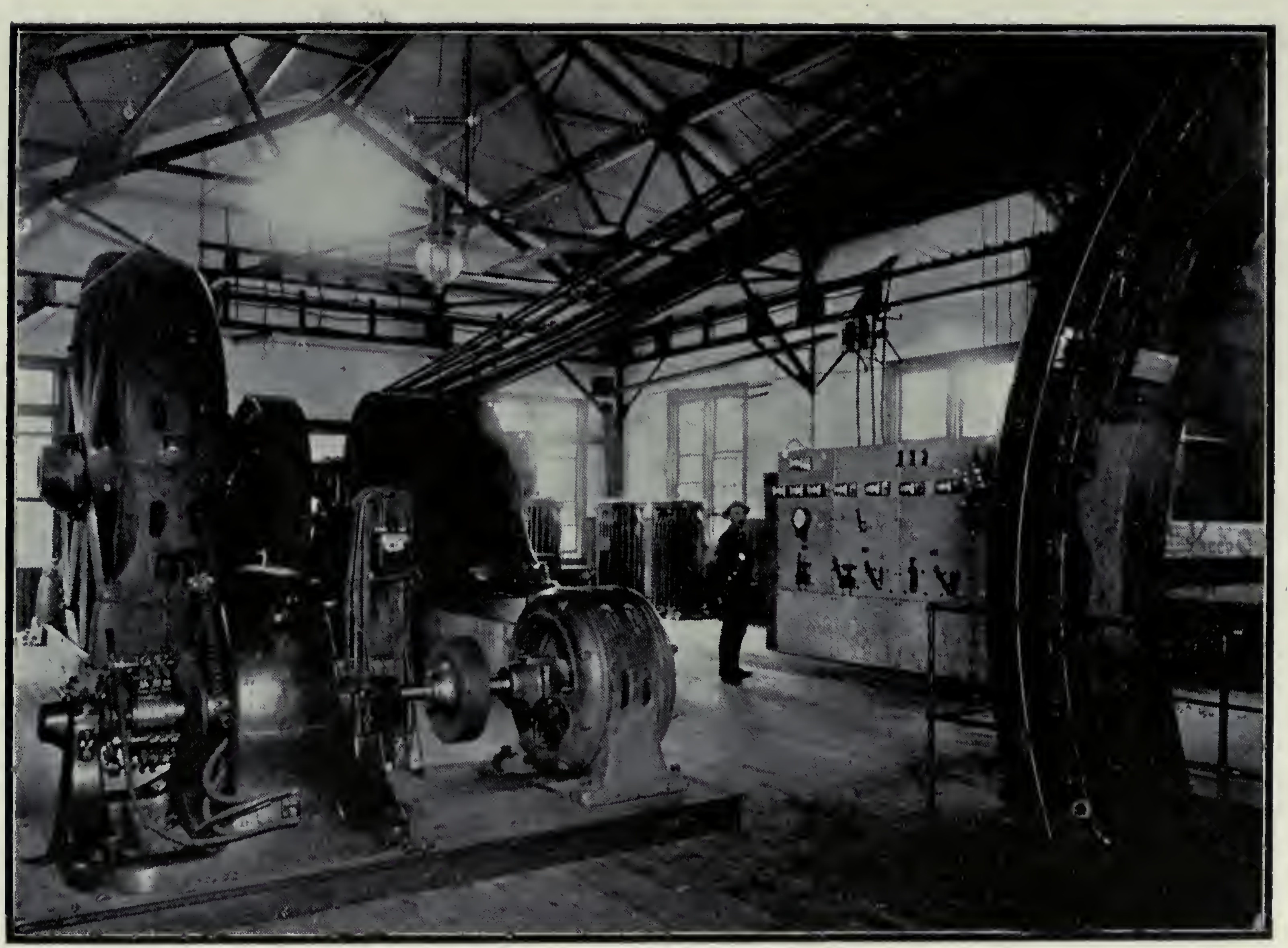
The mines operated by the Anaconda Copper Mining company during the year 1902, were the Anaconda, Never Sweat, St. Lawrence, Mountain Con, Green Mountain, Diamond, Bell and High Ore.

William Scallon is general manager, and John Gillie, general superintendent. The company employs 2,356 men under ground, 468 top men and 29 engineers.

The Anaconda mine, John O'Neil, superintendent, employs 460 men under ground, 160 top men and 4 engineers. The shaft is down 1,800 feet, is three compartment with electric flash lights



STEEL GALLOWS FRAME AT ANACONDA MINE



800-HORSEPOWER INDUCTION MOTOR DRIVING AIR COMPRESSOR AT NEVER SWEAT MINE, BUTTE

used for call bells. It is timbered with 10 by 10 square sets; part of the mine is worked by what is known as the back-filling system. In this the square sets are not used but the ground or roof is supported by cribbing, which is removed as the stope is worked, and consequently the same timbers are used all through a lift of 100 or 200 feet.

There was considerable discussion among mining men and miners as to the safety of this system when first introduced, but time has demonstrated that it is a success.

Where the ground is solid and the walls good, with experienced miners to dress the back safely after blasting, in my opinion it is safe mining, and in the last two years, there has not been a single accident recorded where the back filling system is in operation.

There are two double-decked cages with 8-ton skips attached. A Union Iron Works engine, 30x72 with a flat rope 1-2x8 inches. Small ore bins are constructed under ground at the different levels to receive the ore from the stopes. The skips are loaded from these small bins, the gates of which are worked by compressed air. In this way the eight-ton skip is loaded and hoisted to the surface in a few seconds. Ore bins are constructed at the top of the shaft, and the ore dumped automatically from the skips into the bins.

The gallows frame is of steel and is 100 feet high.

Most of the ore is hauled from the stopes by horses, and in some of the mines, small electric motors are in use. There are underground stables, and the horses are seldom brought to the surface.

The St. Lawrence mine, John O'Neil, superintendent, employs 425 men under ground, 34 top men and 3 engineers.

The main shaft is down 1,885 feet, 85 feet of which were sunk in 1902. This shaft has three compartments and electric flash light call signals. The mine is timbered with 10x10 square sets. The gallows frame is of steel, 100 feet high and a Union Iron Works engine, 30x72 cylinder. Flat steel rope 5-8x8 inches, and two double-deck cages with two eight-ton skips with practically the same arrangement for handling the ore as that of the Anaconda mine.

A Reidler pump with a capacity of 600 gallons a minute is situated at the 1,000 foot level, and the water from the Never Sweat, Anaconda and St. Lawrence pumped through this shaft.

At present both the Anaconda and St. Lawrence are working the same vein, and are almost connected on each level. Also with the Mountain View, Pennsylvania and Moonlight.

The Never Sweat mine, John O'Neil, superintendent. The main shaft is down 2,000 feet; has three compartments with flash light call signals. The hoisting engine is designed to lift 32,000 pounds with 125 pounds of steam, 3,000 feet per minute. It is a Union Iron Works engine with a high and low pressure 26x72 and 46x72 cylinder and is 8,000 horse power. This engine is a sister engine to the one at the Mountain Con, and weighs 375 tons. The cable is a flat steel rope 1-2x8 inches. There are two double deck cages with eight-ton skips attached. and the arrangement of ore bins at the levels and the hoisting and automatic dumping is the same as that of the Anaconda mine.

The air compressor plant which furnishes the compressed air for the Anaconda, St. Lawrence and Never Sweat mines is situated at this mine, and is composed of an 800 horse power electric motor which runs two 800 horse power compressors, and one 1,200 horse power compressor.

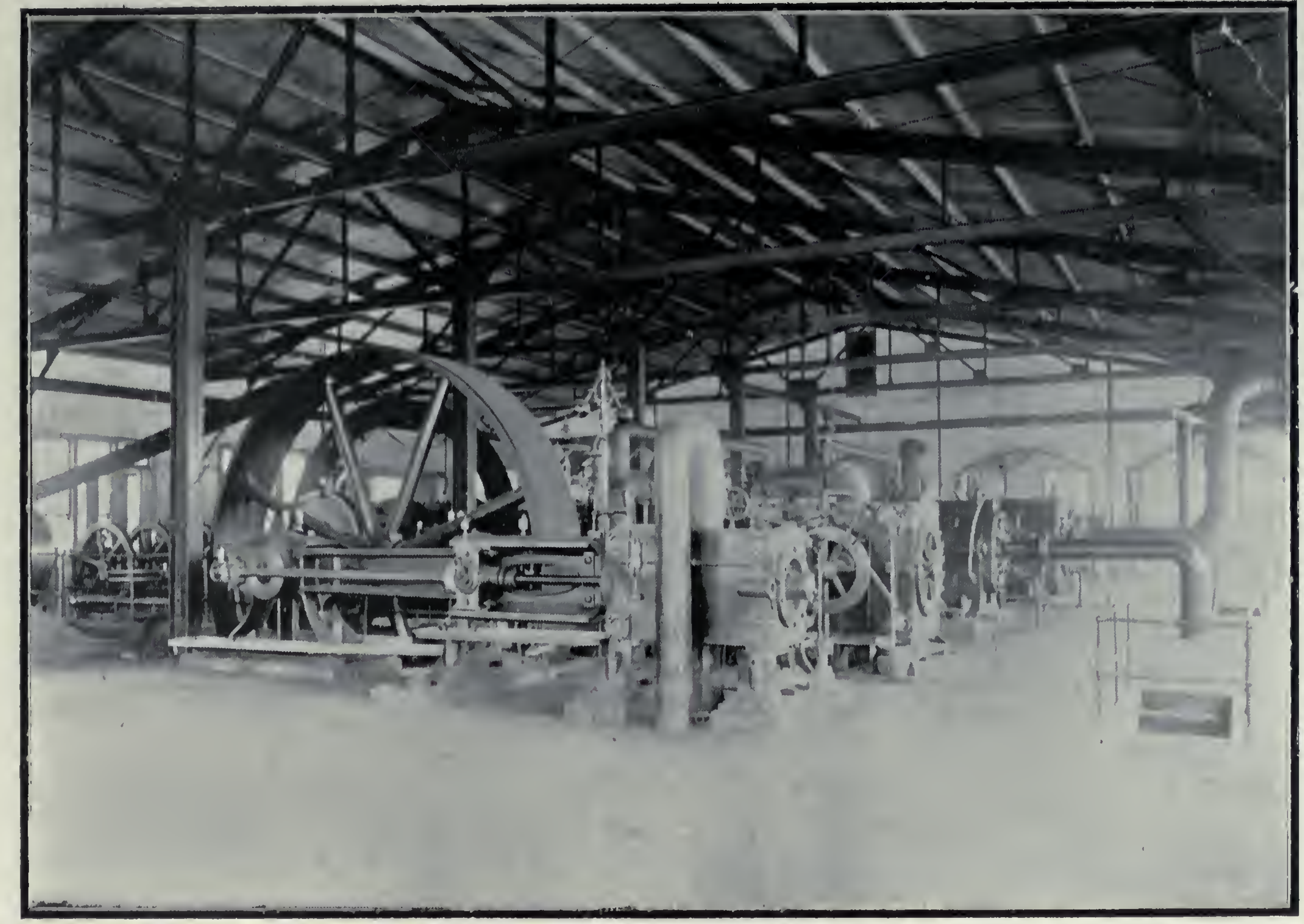
This mine is also timbered with 10x10 square sets, and many of the lower levels, are worked under the back-filling system.

The High Ore mine, William Skyrme, superintendent, employs 250 men under ground, 57 top men and 3 engineers. The shaft is down 2,200 feet, is three compartments. A 30x72 Union Iron Works engine is used and a flat steel rope, 1-2x7 inches. Two three deck cages are used here, and the mine has a very extensive pumping plant on account of having to handle all the water from the Mountain Con, Green Mountain, Bell and Diamond and it is only a matter of a short time when the water from the Anaconda group will be pumped from this mine. A drain tunnel is being driven from the St. Lawrence to the High Ore which will be completed in a short time.

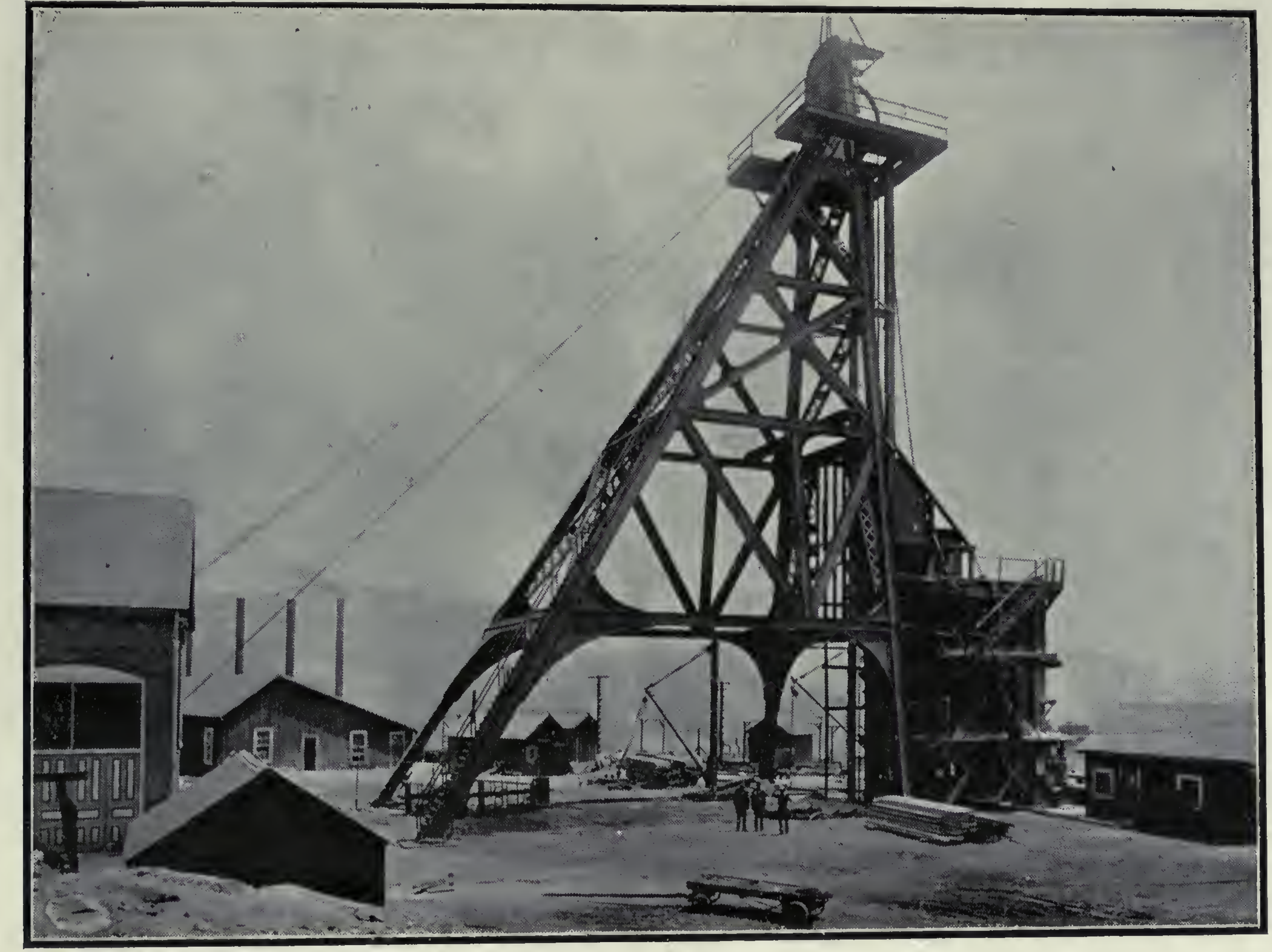
The Bell and Diamond mines, James Higgins, superintendent employ 471 men under ground, 85 top men and 6 engineers.

In the Diamond, the main shaft is down 2,200 feet, is three compartment and has the electric flash light signal system.

The mine is timbered with 10x10 square sets. There are two double deck cages with eight ton skips attached, a flat steel rope 1-2x7 inches and a Risdon engine 30x72 cylinder. A steel gallows frame 110 feet high.



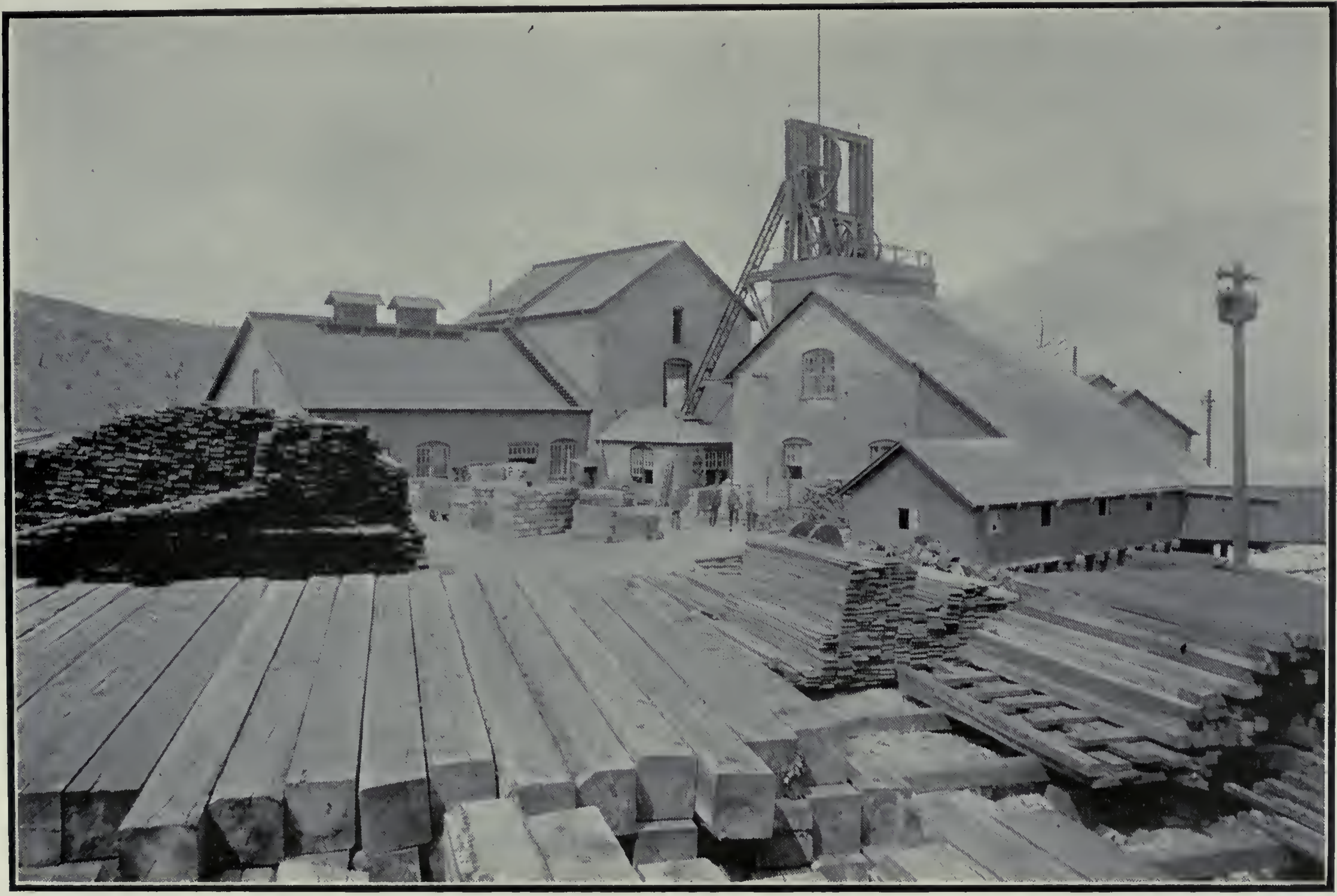
COMPRESSOR VIEW AT NEVER-SWEAT MINE, BUTTE



STEEL GALLOWS FRAME, DIAMOND MINE, BUTTE

COMPRESSOR VIEW AT NEVER-SWEAT MINE, BUTTE

MOUNTAIN VIEW MINE, BUTTE



WEST COLUSA MINE, BUTTE

The Bell adjoins the Diamond on the east. The shaft is down 1,800 feet, and there are two double-deck cages with flat steel rope 1-2x6 inches. A Chicago Iron Works engine, 28x40 cylinder. There are also two Ingersoll Sargent air compressors of 70 drills capacity. The mines are timbered with 10x10 square sets.

The Mountain Consolidated, James Keegan, superintendent, has the main shaft down 2,200 feet. It employs 300 men under ground, 49 top men and 3 engineers. There are two four-deck cages with flat steel ropes 1-2x8 inches and a Union Iron Works engine 26x72 and 46x72 high and low pressure. This is a sister engine to the one at the Never Sweat. There is also an Ingersoll Sargent air compressor of 90 drill capacity.

The Green Mountain is situated between the Mountain Con and Diamond mines, James Keegan, superintendent. This mine employs 32 men underground, 6 top men and 3 engineers. The shaft is down 2,200 feet. There is a Webster Camp & Lane engine 30x72 cylinder, a flat steel rope 3-4x7 inches.

All of the mines of the Anaconda company are connected and the ventilation is good.

Boston & Montana Company.

The mines owned and operated by the Boston & Montana company during 1902 are, The Mountain View, Leonard, East and West Colusa and Pennsylvania. The Moose is worked under lease by Eugene Carroll & Company.

1,158 men find employment in and around the mines. 982 men under ground, 153 top men and 23 engineers.

John Gillie is the general superintendent and B. H. Dunshe, assistant general superintendent.

There are safety gates on all cages in use, there are several connections and the ventilation is good.

The Mountain View mine, Josiah Hodge, foreman, employs 225 men underground, 36 top men and 3 engineers. The main shaft is down 1,800 feet, has three compartments and two double-deck cages a flat steel rope 3-8x6 inches, and an E. P. Allis engine 18x48 cylinder. Electric call bells are used and the steel gallows frame is 115 feet high. A Rand air compressor of 35 drills capacity is installed here and the mine is timbered with 10x10 square sets.

The West Colusa, A. J. Daum, foreman, employs 223 men under ground, 28 top men and 6 engineers. The main shaft is 1,400 feet deep, is three compartment and there are two single-deck cages of two car capacity, with a flat steel rope 1-2x6 inches. Flash lights are used for call bells and the engine is a Nordberg 20x60 cylinder.

The East Colusa mine, Walace Corbett, foreman, has the shaft down 900 feet in three compartments, the flash light call bells are used. There are 127 men under ground, 9 top men and 3 engineers. There are two single-deck cages, 1 1-8 inch round rope and a Lidgerwood engine, 10x12 cylinder. The mine is timbered with 10x10 square sets.

The Leonard mine, Wallace Corbett, foreman, is down 1,200 feet and the shaft is three compartment with the flash light system. There are two double-deck cages and a flat steel rope 1-2x6 inches and an E. P. Allis engine 20x60 cylinder.

The Leonard is situated on the Meaderville side of Butte and lies between is East and West Colusa and the Minnie Healy mines. These are well connected and the ventilation is excellent.

The Pennsylvania mine, B. H. Dunshe, superintendent, J. C. Adams, foreman, employs 178 men under ground, 37 top men and 6 engineers. The shaft is down 1,500 feet, has three compartments, two double-deck cages and a flat steel rope 1-2x5 inches. The flash light system is used and the mine is timbered with 10x10 square sets. The engine is an E. P. Allis, 19x48 cylinder. The mine is connected with the Mountain View, St. Lawrence and Silver Bow No. 1 and is well ventilated.

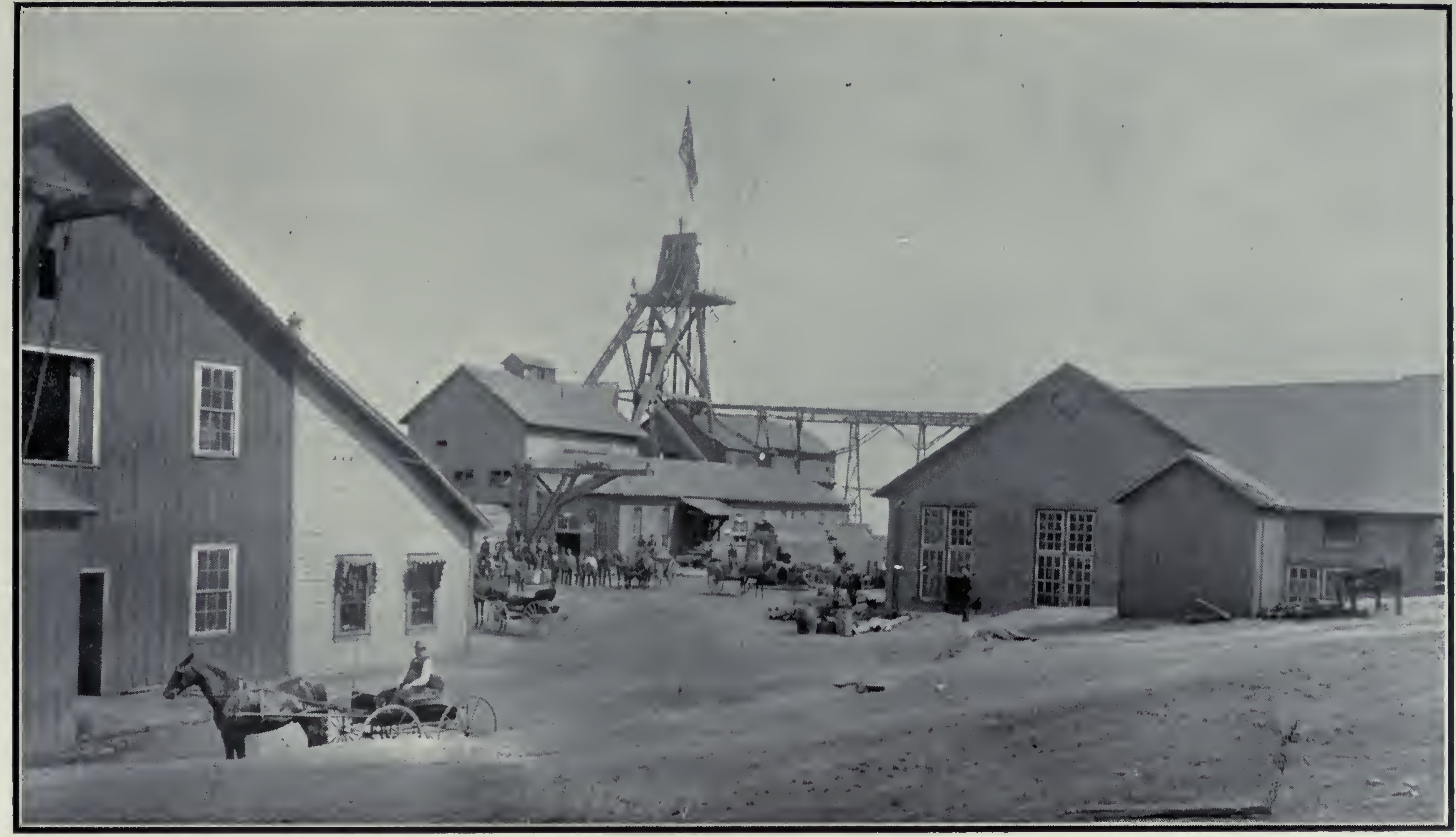
The Moose mine, owned by the Boston & Montana company, is operated by Eugene Carroll and others under a lease. There are 25 men under ground, 4 top men and 3 engineers. The shaft is down 400 feet, 100 of which was sunk in the past year. The character of the ore is gold and silver.

There is a single-deck cage with a 1-inch round rope. An Ottumwa engine 10x12 cylinder and the timbering is with stulls.

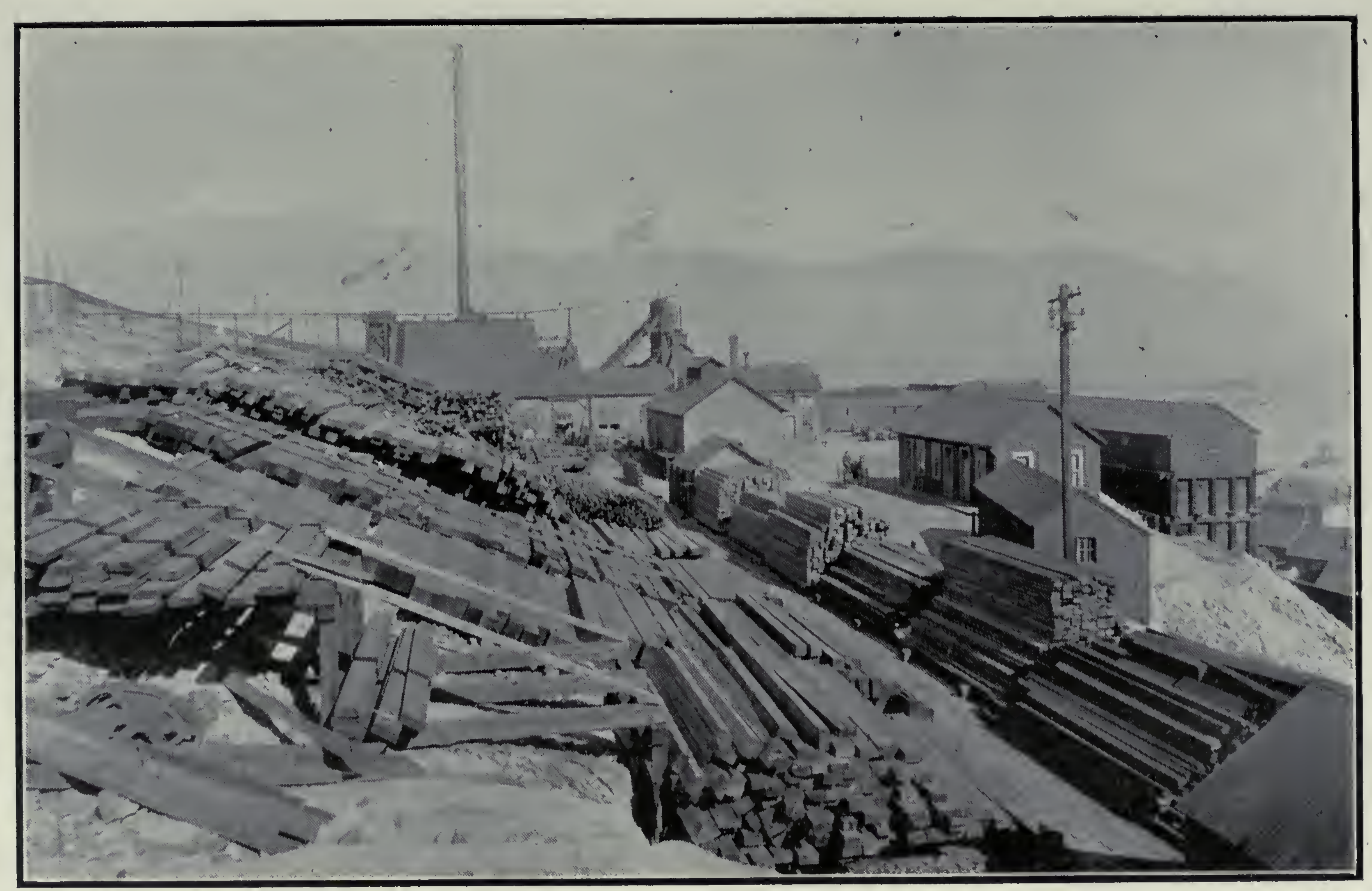
The Butte & Boston Mining Company.

The mines owned and operated by this company during 1902 are the Silver Bow No. 1 and 3, East Gray Rock, Berkeley and the Blue Jay. The Blue Jay has not been worked for several months and the Tramway and Snohomish are being worked by receiver. The company employs 464 men under ground 83 top men and 12 engineers. The ore from these mines is shipped to the smelter at Meaderville.

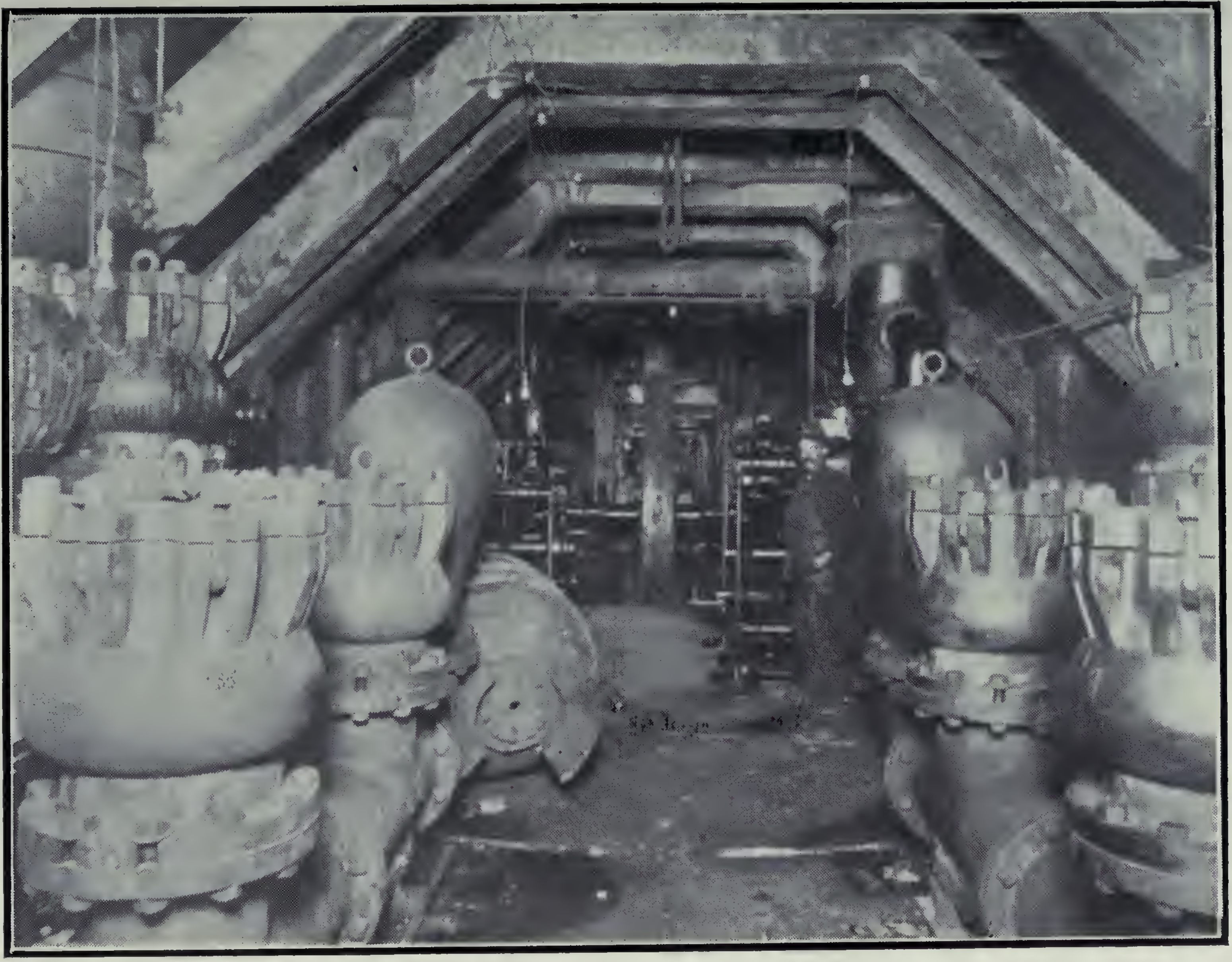
The Silver Bow No. 1, W. E. Kane, superintendent, employs



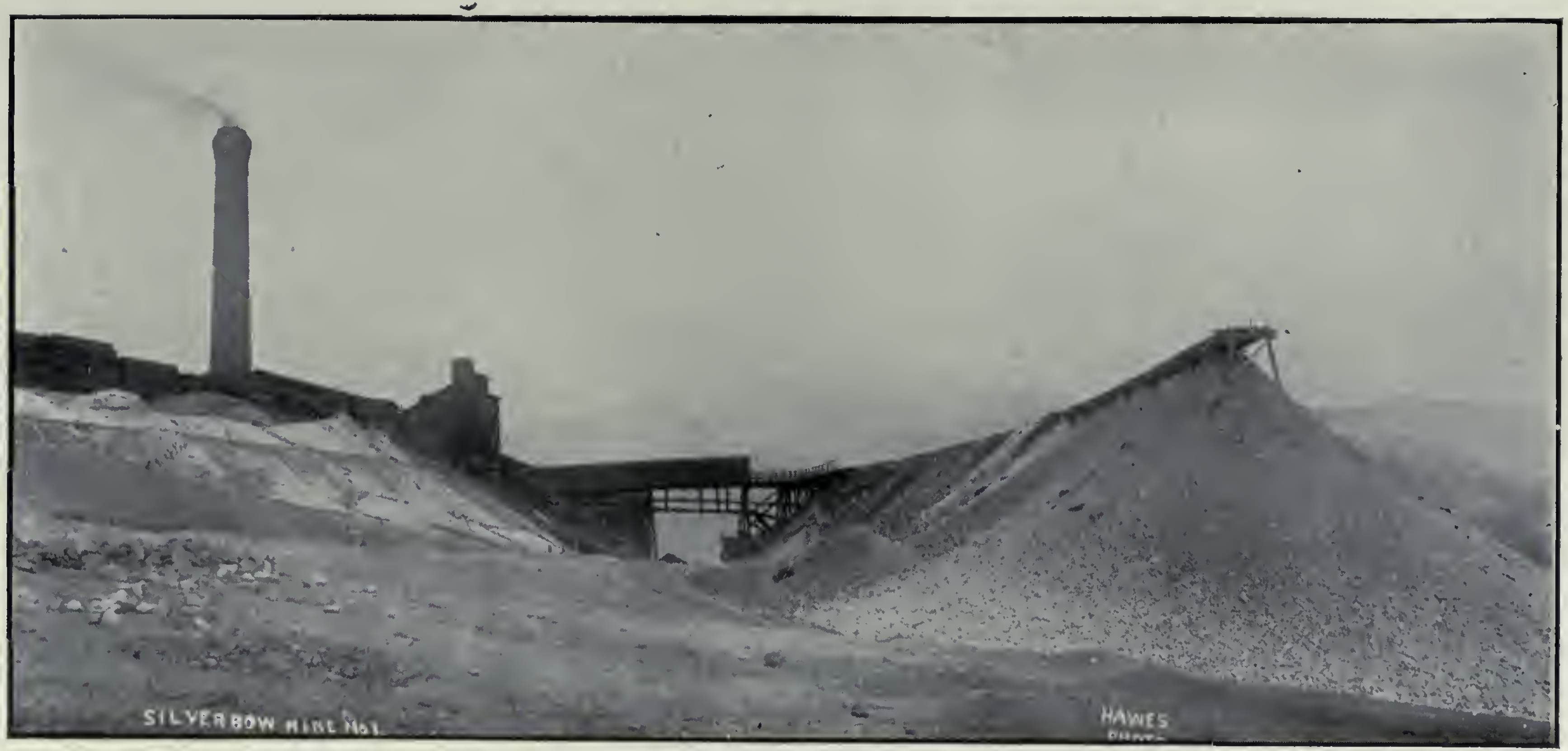
LEONARD MINE, BUTTE



PENNSYLVANIA MINE, BUTTE



1,200-FOOT STATION PUMP, LEONARD MINE, BUTTE



SILVER BOW MINE NO. 1, BUTTE

100 men under ground, 3 top men and 3 engineers. The shaft is down 1,000 feet, is three compartments and the mine is timbered with square sets and stulls. The flash light system is used for call bells and there are two single-deck cages, a flat steel rope 3-8x4 inches and an E. P. Allis engine 16x42 cylinder. The mine is connected with the Silver Bow No. 3 and the Pennsylvania and is well ventilated. There is a Reidler pump on the 1,000 foot level with a capacity of 800 gallons per minute.

The Silver Bow No. 3, W. E. Kane, superintendent, employs 50 men underground, 12 top men and 3 engineers. The shaft is down 700 feet, the electric flash system is used, and the mine is timbered with square sets and stulls. The shaft is 4 compartment with two single-deck cages; a flat steel rope 1-2x4 1-2 inches, and a Risdon engine 12x14 cylinder. At the 600 foot level there is a compound Knowles station pump with a capacity of 500 gallons. This mine is connected with the Silver Bow No. 1.

The East Gray Rock, Homer Emerson, foreman, has 200 men under ground, 25 top men and three engineers. The shaft is 1,600 feet; has three compartments with electric flash system, two double-deck cages with safety doors, a flat steel rope 1-2x6 inches and a Chicago Iron Works engine, 20x48 cylinder, and a Nordberg air compressor with a capacity of 28 drills. The mine is connected with the Diamond and West Gray Rock and the ventilation is good.

The Berkley, Edward Finigan, foreman, employs 500 men under ground, 15 top men and 3 engineers. The main shaft is 900 feet, with electric flash system, and the timbering is 10x10 square sets. There are two single-deck cages with 1 inch round rope, and a Griffith & Wedge engine, 18x32 cylinder. The mine is connected with the Rarus and Snohomish and the ventilation is excellent.

The Snohomish and Tramway are worked by J. S. Harris as receiver, J. B. Williams, foreman. The Snohomish employs 27 men under ground, and the ore is hoisted through the Berkley shaft. The Tramway employs 16 men under ground and the ore is hoisted through the West Colusa.

The Colusa Parrot Mining Company.

The mines operated by this company during the year 1902 are the Original, and East and West Stewart, Senator W. A. Clark, is the owner, A. H. Wethey, manager, and Thomas Bryant, superintendent. There are 557 men under ground, 49 top men and 9 engineers. New steel gallows frames are being erected at the Original and West Stewart, and the foundations are being laid for two of the most powerful and latest improved hoisting engines, the gallows frame at the West Stewart is already placed and is 120 feet high, one of the highest in Butte. The engine bed here is about completed and the placing of the engine will be done very soon. At the Original the steel gallows frame is on the ground, and the foundation work is progressing rapidly.

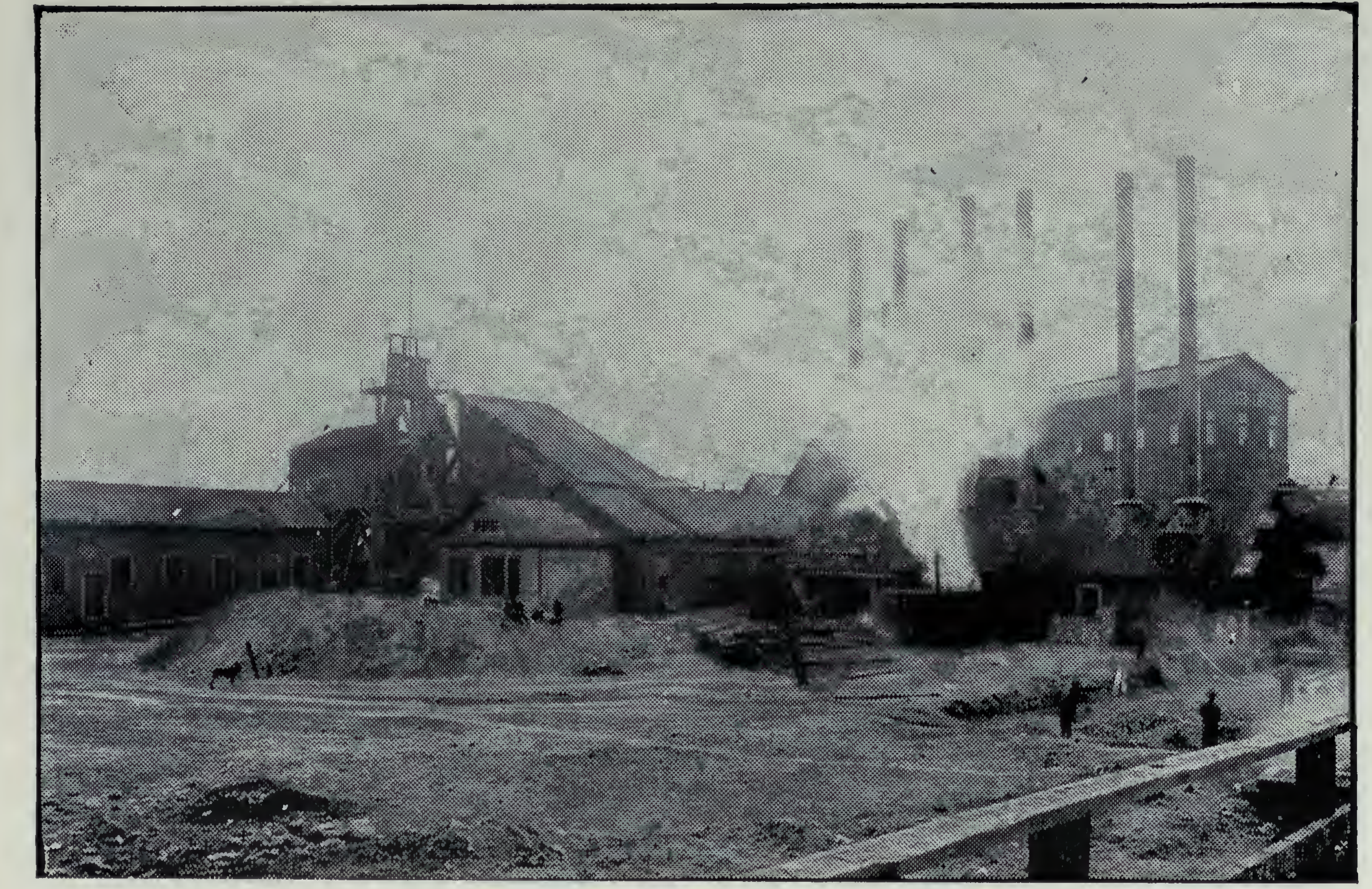
The Original mine, Thomas Bryant, superintendent, Joe Bryant, foreman, employs 300 men under ground, 20 top men and 3 engineers. The shaft is down 1,400 feet, 100 of which were sunk in 1902. There are two compartments, in one a double deck cage closed on three sides with sheet iron, and the regulation gate on the fourth. In the second compartment is a four ton skip which dumps automatically. The mine is timbered with 10x10 square sets and the electric flash system is used. The engine is an E. P. Allis, 18x16 cylinder and the rope is a round 1 1-4 inch. There is also a compressor with a capacity of 25 drills. The mine is connected with the Gagnon and the East and West Stewart and the ventilation is excellent.

The East Stewart, Thomas Bryant, superintendent, employs 140 men under ground, 14 top men and 3 engineers. The shaft is three compartment, is down 1,300 feet, and is on an incline of 74 degrees. The electric call bells are used and the timbering is 10x10 square sets. The engine is an E. P. Allis 16x30 cylinder with a round 1 1-8 inch rope and a double-deck cage with skip. The steel gallows frame at this mine was one of the first erected in Butte. The gallows frame already in place is 120 feet erected in Butte. The mine is connected with the Nipper, Parrot, West Stewart and Original and is well ventilated.

The West Stewart mine, Thomas Bryant, superintendent, Thomas Kilgallon, foreman, employs 114 men under ground, 15 top men and 3 engineers. The main shaft is down 1,100 feet, 650 of which were sunk this year. The old engine and gallows-frame at the mine will be removed to make room for the largest and most improved machinery in Butte. The gallows-frame already in place is 120 feet high. The mine is connected with the Original and East Stewart and the ventilation is good.

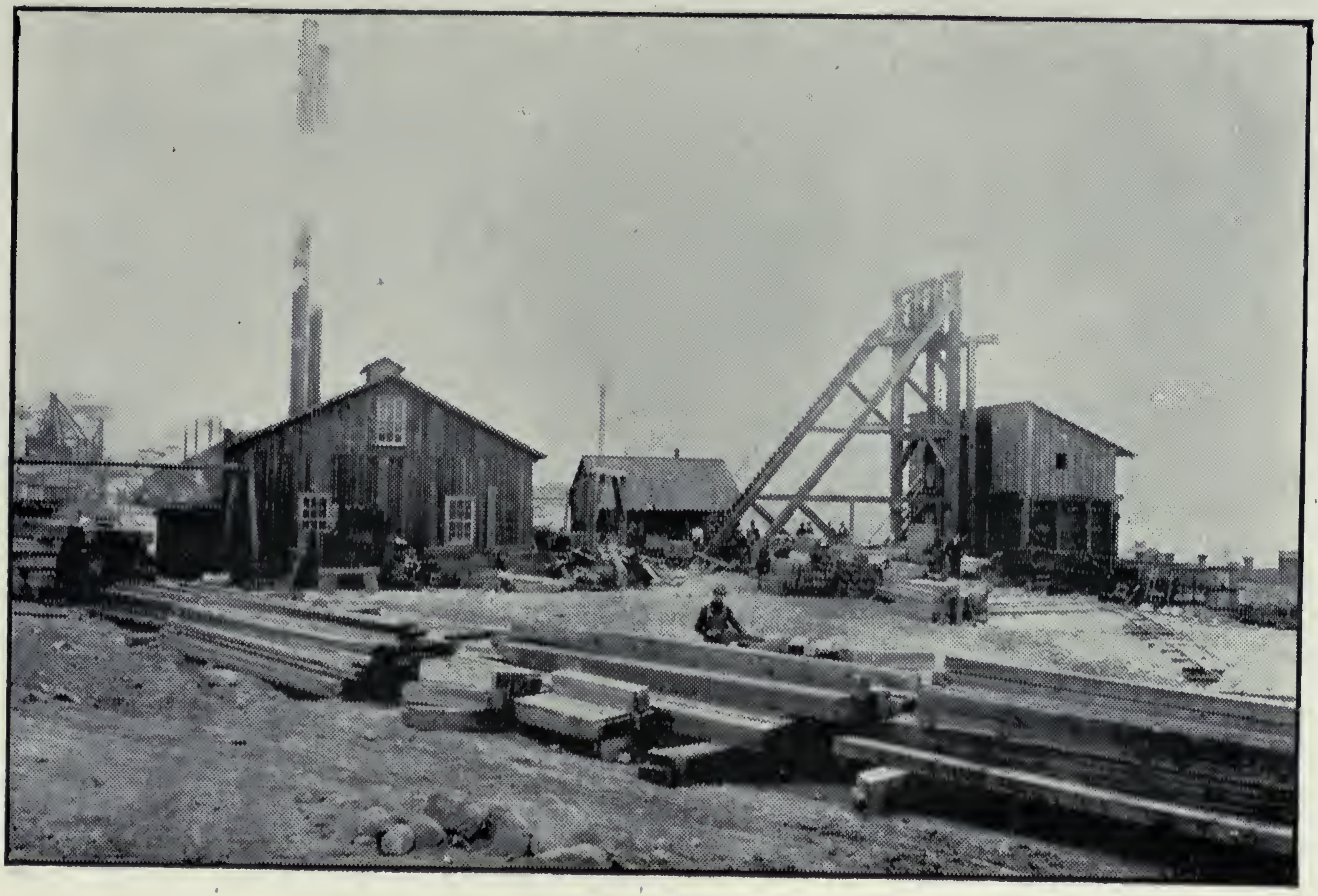
The United Copper Company, Montana Ore Purchasing Co.

The mines operated by this company during 1902 are the

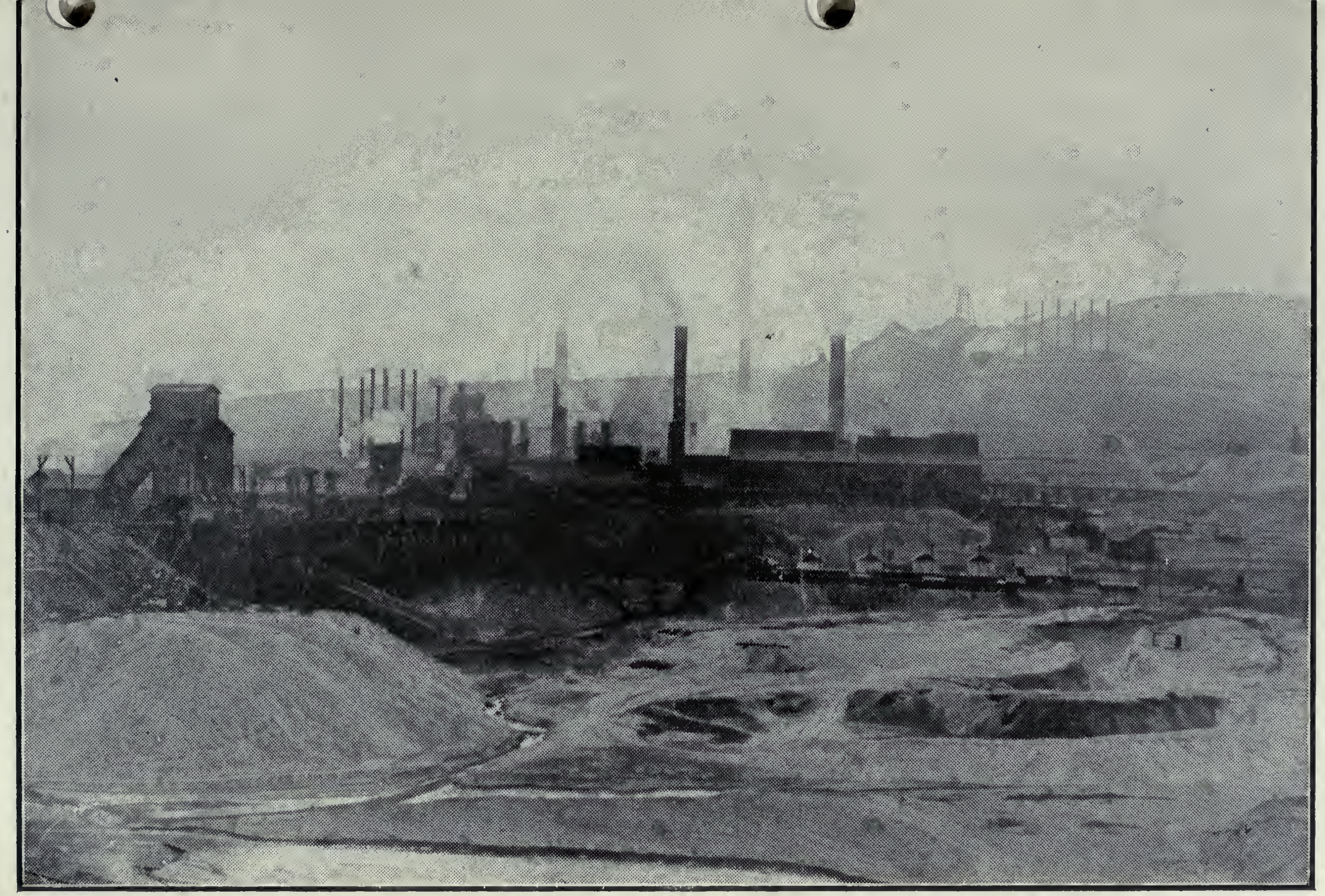


GENERAL VIEW OF THE ORIGINAL MINES, BUTTE

EAST STEWART MINE, BUTTE



WEST STEWART MINE, BUTTE. GENERAL VIEW



MONTANA ORE PURCHASING COMPANY'S SMELTER, BUTTE—RARUS MINE IN THE DISTANCE

Rarus, East and West Cora, Minnie Healy (shut down at present account of question of ownership between the M. O. P. Co. and others), and the Nora, which promises to rank in the near future as one of the best producers in Silver Bow County.

The company employs 1,127 men under ground, 115 top men and 15 engineers.

The Rarus mine, George H. Robinson, general superintendent, Cyrus Trerise, assistant superintendent, Nick Treloar, foreman, employs 420 men under ground, 55 top men and 3 engineers. The shaft is down 1,300 feet, is three compartment with electric flash light system of call bells. There is a three-deck cage in one compartment, a double-deck cage with a six ton skip attached, and flat steel ropes 3-8x6 inches. The engine is a Webster Camp & Lane 28x48 cylinder. A foundation has been laid for a larger hoisting engine which is expected to be in operation by December 1. The new engine was built by Webster Camp and Lane, of Akron, Ohio, and is one of the largest in the state. It is equipped with all modern appliances and is 32x72 cylinder. The 20-foot reels will hold 3,600 feet of 3-8x8 inch flat rope. The engine has a lifting capacity of 10 tons at that depth. The mine is timbered with 10x10 square sets and has several connections with other mines, making the ventilation good. There are two Rand compressors 20x48 compound air cylinders rated at 50 drills capacity each. This plant furnishes air to the Minnie Healy. A foundation has been placed for a 600-horse power electric motor to run one of these compressors with power from the Missouri River Electric Power Co. The pumping plant is composed of one duplex triple expansion wood lined pump 11x16x28x5 1-2x18. This pump was built for a 1,400 foot lift and is placed at the 1,300 level. At the 1,200 level there is a duplex compound condensing pump, size 11x16x4 1-2x18. At the 800 level a Knowles compound condensing pump 13x26x 9x24. There is also at this station another Knowles compound condensing pump 16x24x10x24.

The Minnie Healy mine. This mine employed 440 men under ground, 10 top men and 3 engineers. It is closed by litigation.

The East and West Cora mines employ 200 men under ground, 25 top men and 3 engineers. John Birmingham is foreman. The West Cora shaft is down 900 feet. That of the East Cora is down 1,500 feet, 700 of which were sunk this year. 100 feet in 1902 were sunk in the West Cora. At the East Cora there is a 20 x60 Fraser & Chalmers piston valve hoisting engine with a capacity of 3,500 feet, double-deck cages and 1 1-4 inch rope. The mine is timbered with 10x10 square sets. The West Cora has hoisting engine 16x20, geared double-deck cages and 1 1-8 inch round rope.

The Nora mine, Sam Hall, foreman, employs 59 men under ground 20 top men and 3 engineers. The shaft is two compartment and is down 300 feet. The hoisting engine is 12x14 cylinder and the rope is round 7-8 inch. There is also a five drill compressor.

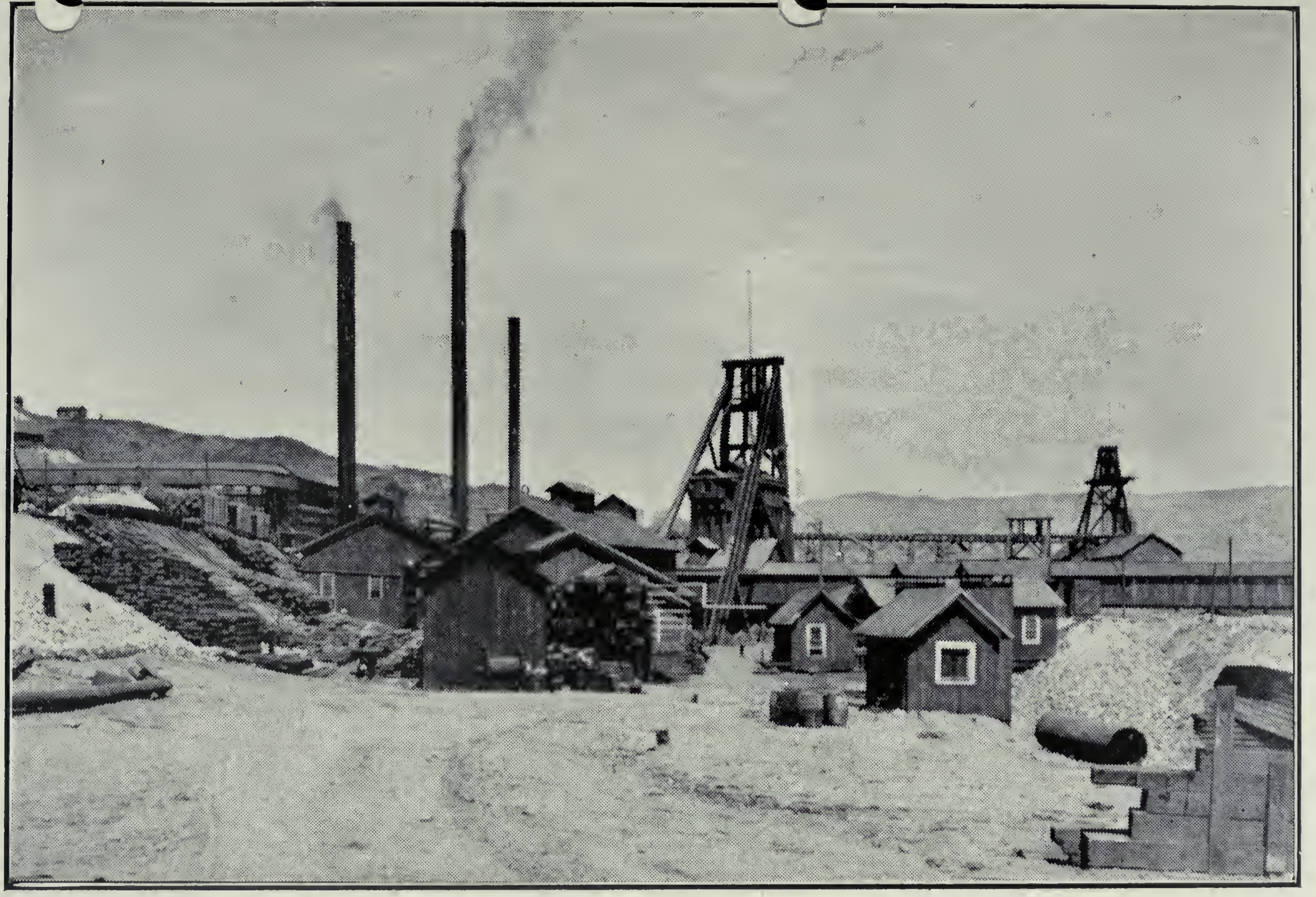
The Parrot mine, owned and operated by the Parrot Mining Co., F. A. Gallway is superintendent. This mine employs 320 men under ground, 66 top men and 3 engineers. The main shaft is down 1,500 feet and is three compartment. There are two double-deck cages with 10 ton skips attached with improved facilities for the handling and automatic dumping of ore into surface chutes. There is a powerful hoisting engine of 2,500 horse power with a lifting capacity of 10 tons, 3,000 feet. It was built by the Union Iron Works at San Francisco in 1878 and is 28x96 cylinder. This engine was shipped here from Virginia City, Nevada, about two years ago, where it has done service in some of the leading mines of that camp. The rope is flat steel 5-8x8 inches, and the steel gallows frame is 112 feet high. There are two compressor plants, one an Ingersoll Sargent 22x48x38x48 of 80 drill capacity, and the other a Rand Drill Co. of 22 drill capacity. The timbering is 10x10 square sets and there are several connections and exits, with good ventilation. The electric flash light system is used.

The Colorado Mining and Smelting Co.

The Gagnon mine, W. F. Word, superintendent, C. J. Adams, foreman. This mine employs 350 men under ground, 26 top men and 4 engineers. The shaft is down 1,800 feet, is of three compartments on an incline of 75 degrees. Electric call bells are used and the mine is timbered with square sets and stulls. There are two three ton skips with a round 1 1-8 inch rope. The engine is a Dixon; 22x48 cylinder. There is an air shaft 700 feet west of the main shaft which connects all levels down to the 1,800. There is also a Rand compressor of 10 drill capacity.

The Speculator mine is operated by the Largey estate. W. W. Wishon is superintendent and Pat Sheehan, foreman. The mine is not in operation now on account of litigation. When in

RARUS HOIST, BUTTE



MINNIE HEALY MINE, BUTTE

operation it employs 125 men under ground, 30 top men and 6 engineers. The shaft is down 1,400 feet with three compartments. The engine is a Webster Camp & Lane 20x48 cylinder with 1-2x5 inch flat steel rope. The mine is timbered with 10x10 square sets and is connected with the Diamond and Bell mines and the ventilation is excellent.

The Washoe Copper Co.

The mines operated by this company are the Moonlight and the Cambers.

The Moonlight, William Skyrne, superintendent, William Pierce, foreman, employs 125 men under ground, 30 top men and 3 engineers. The main shaft is down 1,300 feet with three compartments with the flash light system of call bells. The engine is a Dixon 20x48 cylinder with a flat steel rope 1-2x6 inches. There are also two Ingersoll Sargent air compressors with a capacity of 50 drills. The mine is connected with the Anaconda, Never Sweat and Parrot and the ventilation is good.

The Cambers, Charles L. Bishop, foreman, employs 16 men under ground, 1 top man and 1 engineer. The shaft is down 200 feet.

The Pittsburg Montana Copper Co., known as the Franklin Farrall Co., is at present operating shaft No. 2 on the Meaderville flat. This is down 800 feet, 400 of which were sunk this year. D. B. Gillis is superintendent. There are 24 men employed under ground, 6 top men and 3 engineers. The hoisting engine is a Griffith & Wedge make, 16x32 cylinder and a round 1 inch rope.

Miscellaneous Mines.

The Emma, operated by the Butte Mining and Development Company, A. E. Spriggs, Superintendent, John Fogarty, Foreman, employs 19 men underground, 4 top men and 3 engineers. The shaft is down 800 feet, 400 sunk this year, and has two compartments.

The Gem, operated by H. L. Frank, A. E. Spriggs, Superintendent, William Moylan, Foreman, employs 18 men underground, 2 top men and 2 engineers. The shaft is 700 feet.

The Raven, operated by Berkin, Morris & Mattison, John W. Martin, Foreman, employs 35 men underground, 6 top men and 3 engineers. The shaft is down 400 feet, 100 sunk in 1902.

The Late Acquisition, operated by the M. O. P. Company, J. C.

Driscoll, Foreman, employs 8 men underground, 3 top men and 3 engineers. The shaft is 400 feet, 200 sunk in 1902.

The Sioux Chief, operated by John T. Baldwin, Edwin Bray, Foreman, employs 4 men underground and 2 engineers. The shaft is down 450 feet with a single deck cage, 7-8 inch round rope and 8x10 cylinder hoisting engine.

The Jessie, operated by Lewissohn Brothers, employs 8 men underground, 2 top men and 3 engineers, James Humes is foreman. The shaft is down 400 feet. There is an 8x12 cylinder hoisting engine, with a 7-8 inch round rope.

The Yankee Boy, owned and operated by Charles L. Geyman, employs 12 men underground, 2 top men and 2 engineers. The shaft is down 300 feet. A single-deck cage, 10x12 cylinder hoisting engine, with 7-8 inch round rope. All of the work was done in 1902.

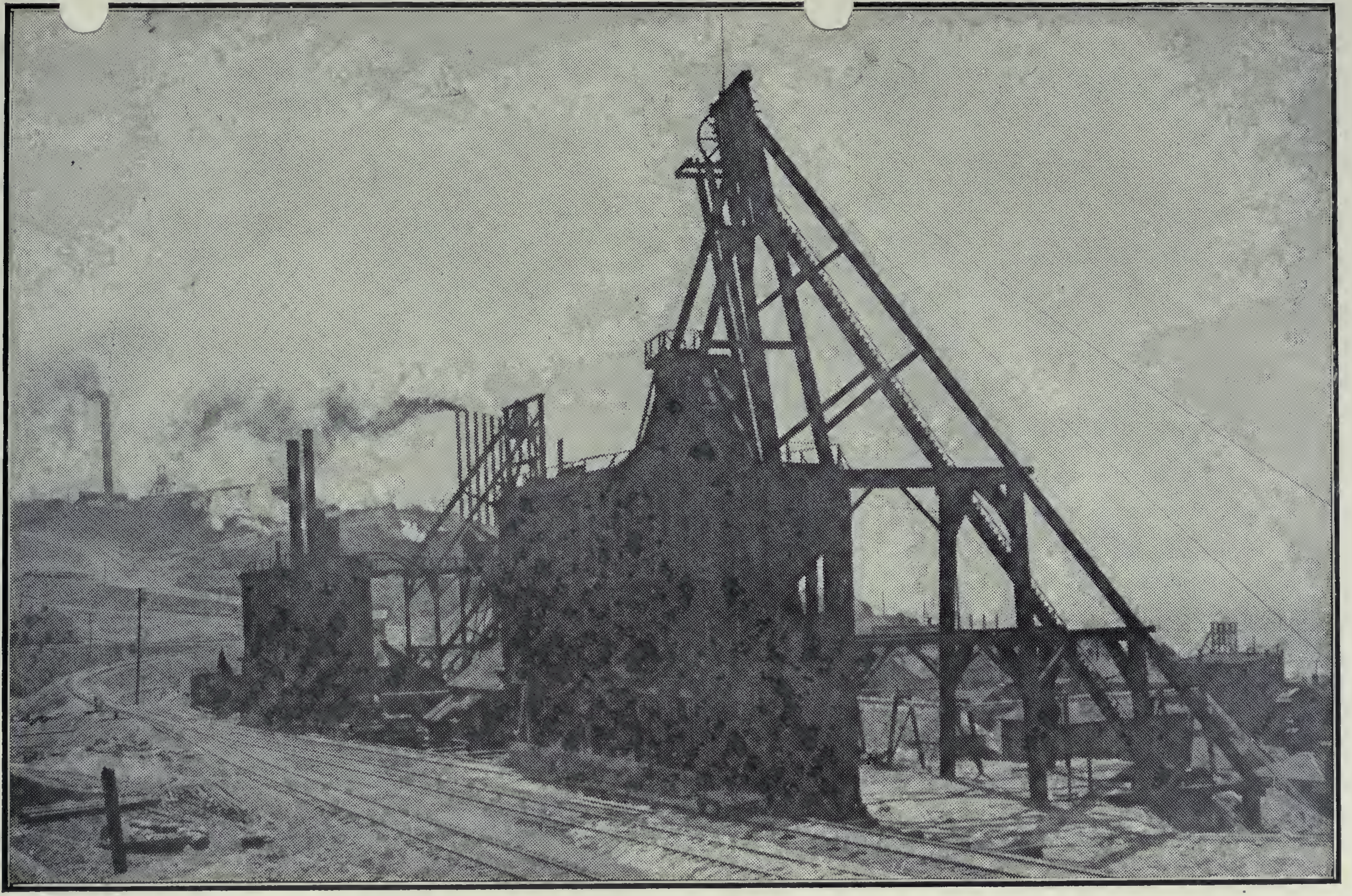
The Yankee Boy Extension, operated by Pat Mullins and others, employs 12 men underground, and 3 engineers. The shaft is 200 feet sunk in 1902.

The Brittania, operated by the Milwaukee Mining Co., G. R. Nickey, Manager, William Jenkins, Foreman, employs 30 men underground and 3 engineers. The shaft is down 400 feet, 150 sunk in 1902. There are two compartments, a single-deck cage, 8x10 hoisting engine, with 7-8 inch round rope and a five-drill air compressor. The ore is silver.

The Lexington, operated by Edward Berthemet, C. C. Ruger, Manager, J. Dvacchiery, Foreman, employs 12 men underground, and 1 engineer. The shaft is 1,500 feet, three compartments. The mine is timbered with stulls. There are two single-deck cages, a flat steel rope 1-2x5 inches and a 15x18 cylinder engine. The ore is silver.

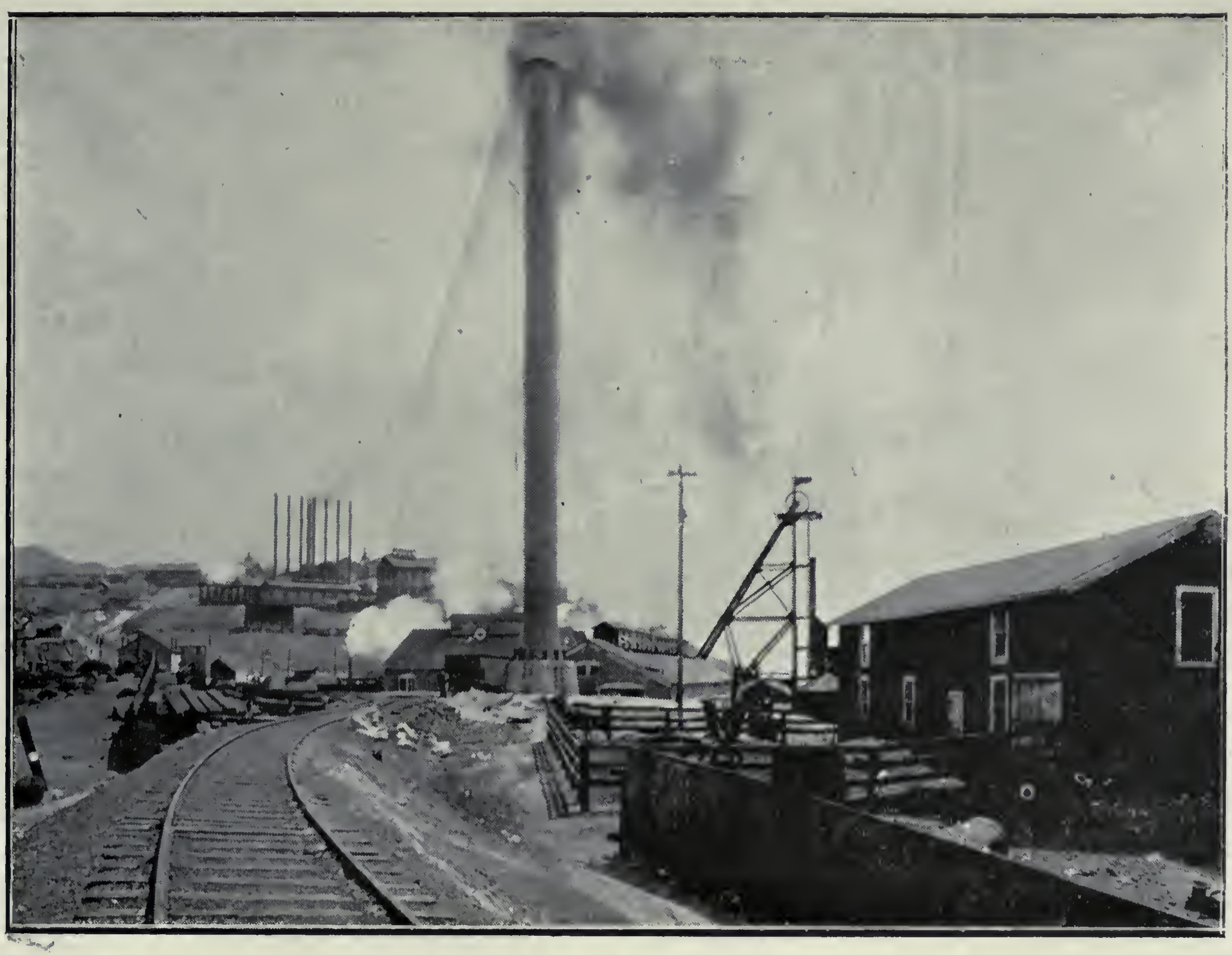
The Alice, owned and operated by the Alice Gold and Silver Mining Company, employs 50 men underground, and 3 top men. The main shaft is down 1,500 feet and has three compartments. A Fraser & Chalmers 18x18 cylinder engine and flat steel rope 1-2x4 inches.

CORA MINE, BUTTE



NIPPER HOIST, BUTTE

SPECULATOR MINE, BUTTE



STEEL GALLOWS FRAME AND STACK AT PARROT MINE, BUTTE

BEAVERHEAD COUNTY.

COMPARATIVE STATEMENT OF PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

METAL	1900		1901		
	Quantity	Value	Quantity	Value	Decrease
Gold, fine, ounces	6,216.928	128,515 31	6,064.884	$125,372 28	$3,143 03
Silver, fine ounces*	233,323.71	301,671 05	240,823.86	226,860 81	74,810 24
Copper, fine lbs	131,494	21,288 88	103,691	16,711 88	4,577 00
Lead, fine lbs	1,013,524	44,291 00	767,259	33,253 01	11,037 99
Total values	....	$495,766 21	....	$402,197 93	$93,568 26

* Coining value.

The Hecla Consolidated Mining Company own and operate the Atlantic and Cleve mines, situated about 17 miles from Melrose. H. Knippenberg is General Manager, S. A. Barbour, Superintendent, and Alex. McDonald, Foreman. These veins are developed by tunnel and are connected by crosscuts at several points. Connections are also maintained between the main tunnel and that farther up the mountain, insuring a plentiful supply of pure air. The walls are extremely hard, requiring but little timbering for support. At the end of the main tunnel there is a shaft which is down 800 feet on an incline of 25 degrees, following the vein. There are 6 men employed underground, 2 top men and 2 engineers. The Cleve is about one mile from the Atlantis, John Huw, Foreman. This mine employs 32 men underground, 6 top men. It is developed by tunnel with a 35 degree incline shaft, down 1,000 feet. The engine is a Fraser & Chalmers 8x10, with a round steel rope and car. The mine is timbered with stulls and the ventilation is good.

LEWIS AND CLARKE COUNTY.

COMPARTAIVE STATEMENT OF PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

METAL.	1900.		1901.		
	Quantity.	Value.	Quantity	Value.	Increase or Decrease.
Gold, fine ounces	70,008.241	1,447,198 78	51,090.691	$1,056,138 32	*$391,060 46
Silver, fine ounces***...........	172,531.70	223,071 29	133,149.24	172,152 55	*50,918 74
Copper, fine lbs	....	....	13,900	2,240 26	**2,240 26
Lead, fine lbs	218,005	9,526 82	77,488	3,358 33	*6,168 49
Total values	....	$1,679,796 89	....	$1,233,889 46	*$445,907 43

*** Coining value. ** Increase. * Decrease.

The Drumlummon Mine.

During the greater portion of 1901 and throughout 1902 the operations of the Montana Mining Company, Limited, on the Drumlummon mine were confined to the extraction of ores in the upper levels, the lower levels of the mine having been permitted to fill with water. The ore extracted has been milled through a sixty-stamp mill which has been in constant operation.

The cyanide plant was operated to the full capacity of 400 tons per day during the open season of both years in treating the tailings which have accumulated during the operations of the mines in the past. This is the second largest cyanide plant in the State and effectuates a very close saving of the precious metals contained in the tailings and which most materially adds to the company's bullion output. The care and precautions exercised for the safety of the employees, as noted in former reports, have not been relaxed during the past two years.

Bald Butte.

The mine and mill of the Bald Butte Mining Company, situated near Marysville, was operated very successfully during 1901 and 1902. Extensive development was carried on in the mine. Besides supplying the forty-stamp mill to its capacity, the new ground exploited yielded satisfactory results both in tonnage and values, and the ore reserves are maintained well ahead of production. The main vein is developed for a length of 2,700 feet its deepest workings not being to exceed 800 feet under the surface. The ore is mined, transported and milled at a very moderate cost, and at the same time nothing is wanting in the mine that is necessary to insure the safety of the men but what is provided, while the mill is a model of its kind.

The Strawberry Mine.

This promising property was opened up during the current year by G. Austin and the Hudson Brothers. A shaft is sunk 55 feet and a short level driven on the vein from which several shipments of high-grade gold ore were extracted.

North Star Mine.

The North Star Mine, at Marysville, owned by Thomas Cruse, was operated during part of 1901 and 1902 by lessees. The ore was milled in the twenty-stamp mill plant of the Bald Butte Mine, also the property of Mr. Cruse.

The Belmont, at Marysville, was closed down in 1901, but operations have lately been resumed and considerable development planned, which is expected to open up new ore bodies and be the means of starting the plant to its full capacity. Mr. J. H. Longmaid, manager and one of the principal owners, is giving the new work his personal attention.

Gold Belt Mining Company.

This company owns the Empire mine, situated west of Marysville. The company, in 1901, constructed a cyanide plant to work the tailings of the old mill, of which there are several hundred thousand tons. During the present season this plant was perfected and enlarged to a capacity of 500 tons each twenty-four hours, and a test run of 3,000 tons was made which showed a saving of 90 per cent of the gold contents. The tanks are loaded by means of horse scrapers, which dump the tailings on a belt conveyer, which delivers to the tanks, the power operating it being electricity generated at the old mill. The gold is precipitated from the cyanide solution by an electrical process.

During 1901 cyanide plants were in operation on the tailings dumps of the Jay Gould and Gloster mines.

Piegan.

This property, which joins the old Gloster mine, has not been operated for several years owing to legal complications which have been adjusted, and development work has been resumed under the ownership of the Piegan Consolidated Mining Company. The mine has been opened by two tunnels on the lead, the lower one being 1,200 feet in length. From the lower tunnel, 750 feet from its mouth, a winze has been sunk to the depth of 125 feet. The vein is in a granite dyke, bounded on the north and south by slate formation. The ore is from two to twelve feet in width and carries good values in gold, the gross output having reached $75,000. Arrangements are completed for the erection of a mill in the spring.

Considerable development work was done at Silver Camp, 25 miles north of Marysville, during 1901 and 1902, and quite a large quantity of ore was shipped from the Dickert-Kruger mines, which are the most extensively developed properties in the district, and consist of the Anaconda and Paymaster claims. These properties are developed by a shaft 200 feet deep and a tunnel 400 feet long. The veins are drifted on for 2,000 feet at various points. Shipments of high-grade gold-copper ore have been regularly made for sometime. The property is equipped with a 30 horse power steam plant and skip. Mr. Fred Dickert is in charge of the property.

Mike Horse.

This mine is developed by a main tunnel 1,100 feet in length besides two other tunnels higher on the lead. The vein shows from three to four feet of ore, which carries high values in lead and silver. There are also large bodies of concentrating ore.

Consolation Group.

Shoue and Thurber have been developing the Consolation group, also located at Silver Camp. Three tunnels have been run on the lead, the longest being 350 feet in length. A large quantity of second class ore is on the dump and considerable high grade ore. The ore carries high-grade values in gold as well as lead and silver.

Copper Camp.

A large force of men was employed in 1901, and the present year on the Kruger copper mines, located in the northwest portion of the county, and shipments have been made of high-grade copper ore. The mine is equipped with a compressed air plant of large capacity, which operates the drills and other machinery connected with the mine. Tunnels aggregating one and a half miles in length have been driven to develop the vein at various depths in the mountain, besides several thousand feet of drifts and crosscuts. The property is closed down temporarily.

Red Bird.

The Red Bird Mining Company was originated in 1902 and acquired the property formerly known as the Punches mines, which are located on Greenhorn Gulch, twelve miles northwest from Helena. The mines have been continuously worked during 1901 and 1902. The main incline is down 500 feet, with levels running on the vein in both directions. The property is equipped with steam hoists. The mine contains a fine quality of iron ore, which is shipped to East Helena smelters, and copper ore, which is shipped to Butte. Bodies of lead-carbonate ore are also found.

Columbian Mining Company.

This company added, in the spring of 1902, a cyanide plant to its ten-stamp mill, located at York, north of the Missouri River, and the ores of the Golden Messenger mine were being successfully treated until the entire plant was destroyed by fire in September, 1902. The company is now engaged in developing a large body of gold ore in the Messenger mine.

The Argo Mining Company has encountered a body of high-grade copper ore in a tunnel being driven on a claim in Hellgate Canyon, north of the Missouri River.

Twilight.

During 1902 a crosscut tunnel was run 300 feet to the lead on the Twilight mine, owned by Benjamin Malbern and others, at Unionville. The tunnel tapped the vein at the depth of 100 feet, and a level was run west 150 feet. The ore in this level is from four to eight feet in width and yielded fair values in gold.

Rimini.

William Swan & Company, lessees, working the R. E. Lee mine at Rimini, opened up in a 200 foot tunnel, in 1901, a body of galena-silver ore from which an average of one car load a day has been shipped for over a year past. An average of 36 men are employed on the mine.

Steady shipments have also been made from the Mammoth and Flag mines at Rimini.

Mary Aloys.

Solari and Balfino have been developing the Mary Aloys mine, located in the Vaughn district, above Rimini, during 1901 and 1902. Four shafts have been sunk on the lead and ore running high in silver and lead has been shipped to the East Helena smelter.

Josephine.

The Lava Mining Company during the current year has done considerable development work on the Josephine mine, under the management of L. C. Alexander, and a quantity of high-grade lead-silver ore was taken from a winze. The main shaft is down 260 feet and a winze was sunk to a depth of 50 feet in a level run from the shaft. The mine is equipped with a sixty horse power hoist.

Blue Jay Group.

The Spokane and Montana Mining & Milling Company, J. E. Jackson, Manager, during 1901 and 1902 has been developing the Blue Jay Group, located on Bear Gulch, north of Rimini. At date of report, August 25th, a crosscut tunnel, being run to tap the lead at the depth of over 500 feet, was in 900 feet. Surveys indicate that the tunnel will extend to 1,600 feet before reaching the vein. There is also a 150 shaft from the surface. The ore is gold and copper bearing.

Some placer mining has been done on Greenhorn and Magpie gulches, and the Eglanol Placer Mining Company has carried on extensive drifting in Lincoln gulch, the drifts being kept free of water by pumps of large capacity.

MADISON COUNTY.

COMPARATIVE STATEMENT OF PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

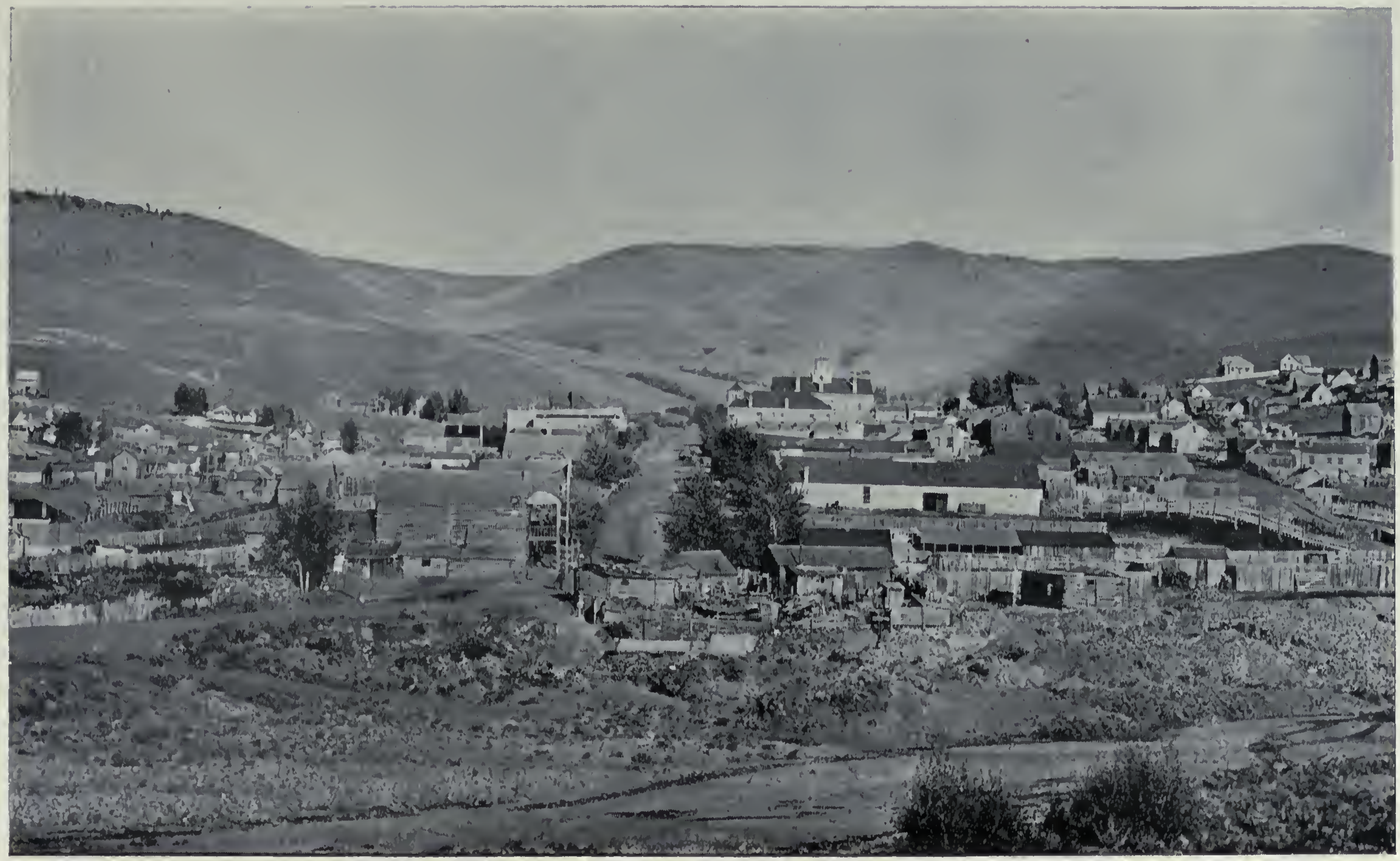
METAL.	1900.		1901.		
	Quantity.	Value	Quantity.	Value	Increase or Decrease.
Gold, fine ounces	26,859.374	$555,232 54	41,079,113	$849,180 63	**$293,948 09
Silver, fine ounces***	130,634.02	168,900 55	183,772.94	237,605 42	**68,704 87
Copper, fine lbs	18,000	2,914 20	3,000	483 51	*2,430 69
Lead, fine lbs	222,000	9,701 40	....	....	*9,701 40
Total values	....	$736,748 69	....	$1,087,269 56	**$340,520 87

*** Coining value. ** Increase. * Decrease.

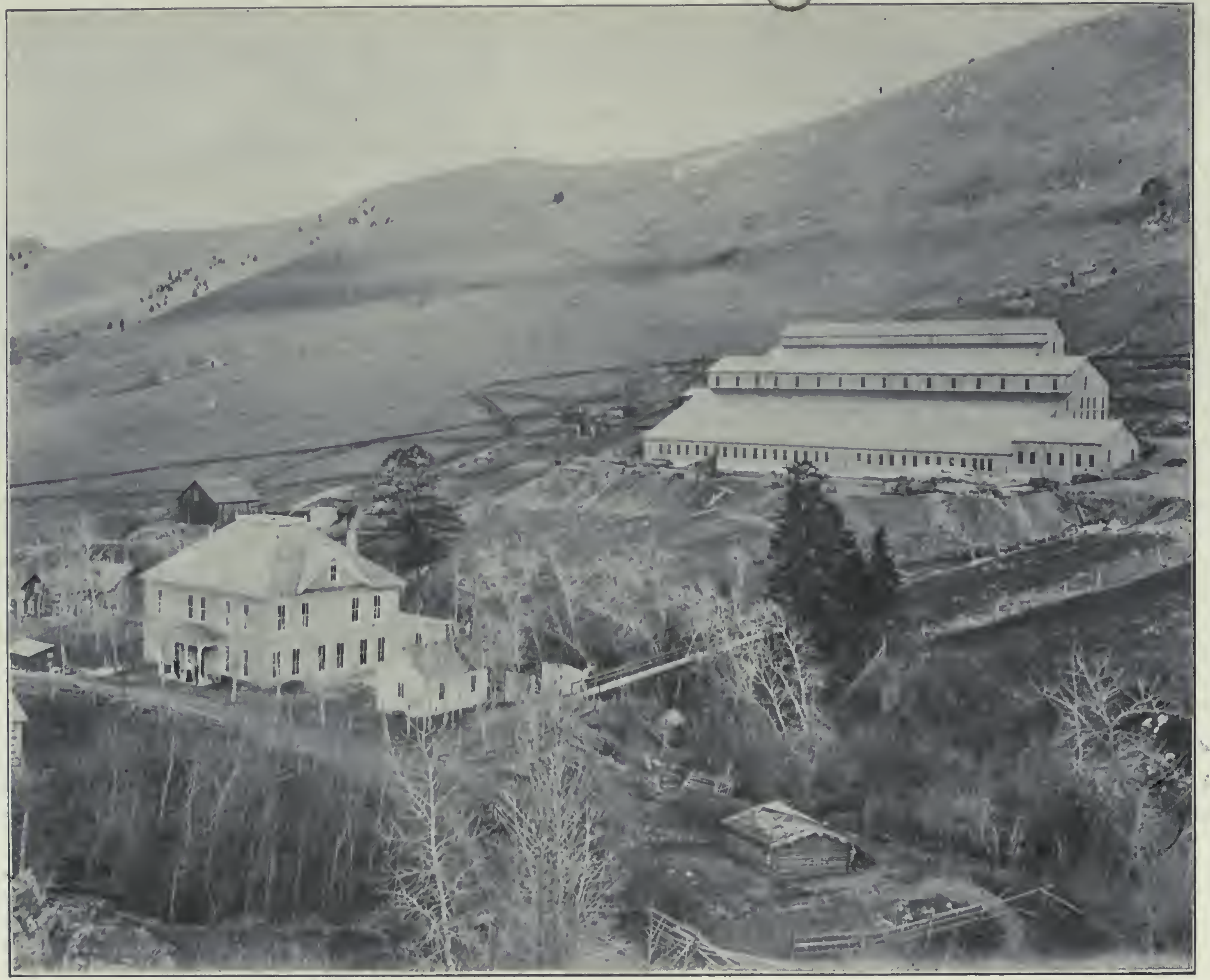
In its mineral possibilities Madison County ranks with the most favored of the mineral bearing sections of the State. The workable lodes are not limited to any particular district, as at least two-thirds of its area is of mineral character, and producing mines have have been developed in nearly every district that has been exploited. The Tobacco Root Range of Mountains is the principal mineral bearing belt in the county. It is some seventy-five miles long, northerly and southerly, and from twenty to thirty miles wide. The easily accessible portion has been scratched over for a length of sixty miles and extends from Whitehall, on the north, to the head of the famous Alder Gulch, on the south, and so general is the mineralization throughout the belt that every district yields its quota to the gross output of the county. Gold is the predominant metal of the lodes the silver produced being chiefly as a by-product of that metal. During the past two years the copper lodes of Bear Gulch, twelve miles east of Twin Bridges, have attracted considerable attention. Several very promising claims are being actively developed, and depth is being attained in order to test the veins thoroughly. Should these develop satisfactorily to the deep it will place Madison County among the list of large copper producers.

Late in the year 1901 the Northern Pacific Railway Company completed a branch line from Whitehall to Alder, within ten miles of Virginia City, which has exerted a stimulus on the mining industry from Whitehall to Summit. Heretofore the cost of wagen transportation was so great that the shipment to smelters of medium grade, refractory ores was prohibitory.

There was during 1902, a general activity in mining throughout the county. Immediate results may not follow, as considerable of the work done was in opening up and developing property in the various districts. Results, however, are bound to follow this period



A VIEW OF VIRGINIA CITY



120-STAMP MILL AT PONY

of exploration, and in the near future we may confidently expect a material increase in the production of all the metals from this county.

Clipper and Boss Tweed Group, located near Pony, A. C. Carson, Superintendent. This group of gold mines, which was developed and operated for many years by W. W. Morris, of Pony, and the late Henry Elling, of Virginia City, was transferred by purchase to a syndicate of Eastern and Butte capitalists in June, 1901, and a new company incorporated to develop and equip the property for operations on a very large scale. Since acquiring the property a large force of men has been constantly employed on the mines developing the veins in every direction. The 100 stamp mill, which was fomerly in the Diamond Hill mines at Hassel, was purchased and erected at Pony, about three miles from the mines. A wire rope tramway was surveyed to transport the product from the mine to the mill,but for reasons only known to the management all construction work on mill and tramway was suspended during the early part of the year, and operations confined to the development of the mines. They consist of seven claims through which run two strong parallel veins, known as the Clipper and Boss Tweed lodes. These are about 600 feet apart. Immense bodies of low grade ore were encountered by the original owners on the Boss Tweed vein, and at a great depth. The new owners have continued development downward, having run a tunnel from the lowest practical site on the mountain, which is now in about 1,600 feet, and from this a shaft is being sunk to gain additional depth, the purpose evidently being to obtain a thorough knowledge of the character of the ores which will be found at a great depth in the vein, before deciding as to the process of treatment. The change which has occurred in the character of the ore in the deeper workings attained by the new company has necessitated, it would seem, a departure from original plans, the ore developed in the upper workings being a light auriferous pyrite, while this changes in the deeper workings into a heavy, auriferous sulphide. There are seven tunnels driven on the group, the two main working tunnels being 1,600 feet in length. The ore bodies vary from a few feet in width to over 100 feet. The various workings are connected by upraises which provides good ventilation and means of exit. In general the condition of the mine is good

Fourth of July Group.

This group adjoins the Clipper-Boss Tweed property, and is owned by the Speculator Mining Company of Butte. W. W. Wishon is

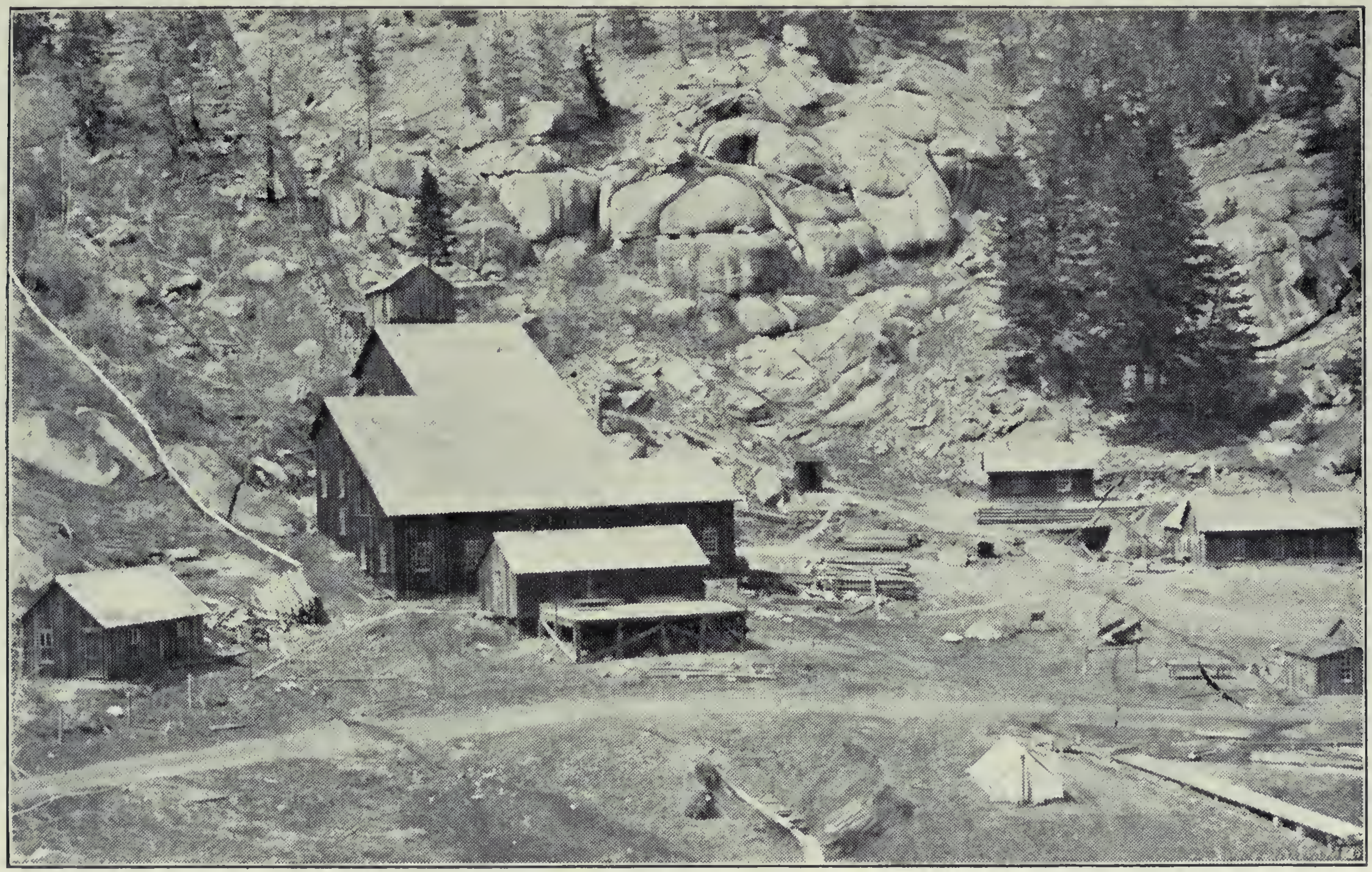
Manager and S. H. Northey Superintendent. The property is developed by three tunnels, the longest being 800 feet. The ore yields fair gold values. During the greater part of the year the mill owned by the Strawberry Company was operated on ores supplied by this group.

Garnet Mining Company.

Work on the property of this company, which is situated within three miles of Pony, was confined to the upper levels, considerable ore of good quality having been left from previous operations. The ore produced by these veins is refractory and is either concentrated on the ground in the twenty stamp mill, which is operated in connection with the mine, or, if sufficiently high grade, shipped direct to a custom smelter. There are several veins on the property which are developed through two tunnels of 400 and 1,000 feet in length. Extensive development is planned for the coming year. A tunnel of great length is to be driven to tap the vein several hundred feet below the present workings.

Revenue and Monitor Mines.

During the past two years this group has been successfully operated under the management of Mr. Roger C. Knox. The consolidation of the two properties under one management, which was effected in 1900, has resulted to the mutual advantage of both. All development is now carried on through the Monitor shaft, which is 160 feet deep. Several winzes are sunk below this point, which gives a total depth on the vein of 300 feet. Work is progressing on the main shaft, sinking it 200 feet lower. During the year the property has been equipped with a complete hoisting plant, consisting of a 60 horse power boiler, 40 horse power engine, and cage. These improvements will enable the company to actively prosecute the development of the group, which will be vigorously carried forward from this time on. The Revenue Company owns a 55-ton cyanide plant, situated about one and a half miles from the mines. This has lain idle for the past three years pending development on the veins. In the meantime a large tonnage of medium and low grade ores has accumulated on the dumps. Extensive repairs and improvements are being made on the mill preparatory to a long period of operations. These properties are steady and reliable producers of high grade gold ore. Regular shipments are made to the smelters, which net a profit above operating expenses. The safety of the employees is given particular attention in the plan of management.



GARNET MINING COMPANY'S MILL, PONY

Red Bluff Mine.

Located at Red Bluff, owned by the Red Bluff Mining Company, Limited, Chas. Austen, Manager. Operations on this property were suspended during the latter part of 1901, and the greater part of the present year, pending the erection of a 100-ton concentrating plant. This plant was recently completed and operations resumed. The Red Bluff mine is one of the early producers of the State, and yet the mine has reached but a depth of 300 feet, 100 of which was sunk by the present owners. Heretofore the success of the property depended altogether on the high grade shipping ore, and as that is a variable quantity of the average vein, operations were attended by alternating success and disappointment. The present company appreciating that the profits were in the lower grade ores, erected the present plant, which is modern in every way and designed specially for the recovery of the values from that class of ores produced by the Red Bluff vein. There are besides several thousand tons on the dumps which will yield a handsome profit in the mill, providing the values are recovered. The ore is pyrite and galena carrying gold. The property is developed by a three-compartment shaft, 300 feet deep, provided with a steam hoist and safety cage. Several exits are maintained, which supply good air and means of escape in case of emergency.

Stella and Uchell Group.

This group is located on Richmond Flat and adjoins the Revenue-Monitor group. The group is under bond to W. B. Millard. R. B. Turner is active manager. Several shafts ranging from 30 to 100 feet have been sunk to tap the vein during the present year. The property at present is in the prospective stage of development. Some small chutes of ore of gool quality have been uncovered and indications favor the discovery of larger and more permanent bodies.

Lehigh.

The Lehigh is a very promising property located about four miles from Richmond Flats, owned and operated by Hugh Elliot. The vein is developed to a depth of 115 feet by an incline shaft, and is drifted on for a length of 120 feet. Regular shipments of gold and silver bearing ore have been made from this property during the greater part of the year.

Watseka Mine.

The Watseka mine is located at Rochester, twelve miles from Twin Bridges, and is owned and operated by the Watseka Gold

Mining Company, Carl H. Hand, General Superintendent; J. H. Smith, Foreman.

During the past two years these mines have been operated without interruption. A large number of men is employed both in extracting ores and pushing new development. Work is carried on through two shafts, one a vertical shaft 300 feet in depth, and the other an incline 650 in depth. Both shafts are equipped with steam hoists of ample power for the work required, and are provided with every convenience necessary to safety and efficient service. The vein is a remarkably persistent fissure and averages high in gold values. In the new ground penetrated during the past year ore bodies containing great tonnage were encountered and in the deep workings the merit of the lode was favorably demonstrated. Here the ore changes into a sulphide and carries better values than was found in the oxide zone. Besides the area of mineralization has materially increased and sections which were barren in the oxide region have developed commercial ore bodies with depth.

The high-grade product of these mines is shipped direct to smelter for reduction. The inferior grades are treated in the old Thistle mill, which has a capacity of 50 tons per day and is leased by the Watseka Company. In order to meet the productive capacity of the mines a 100-ton concentrator is about to be eretced in close proximity to one of the shafts. When this is completed a large addition to the present working force will be required. The general condition of these mines, as related to safety of the men employed, meets every reasonable requirement.

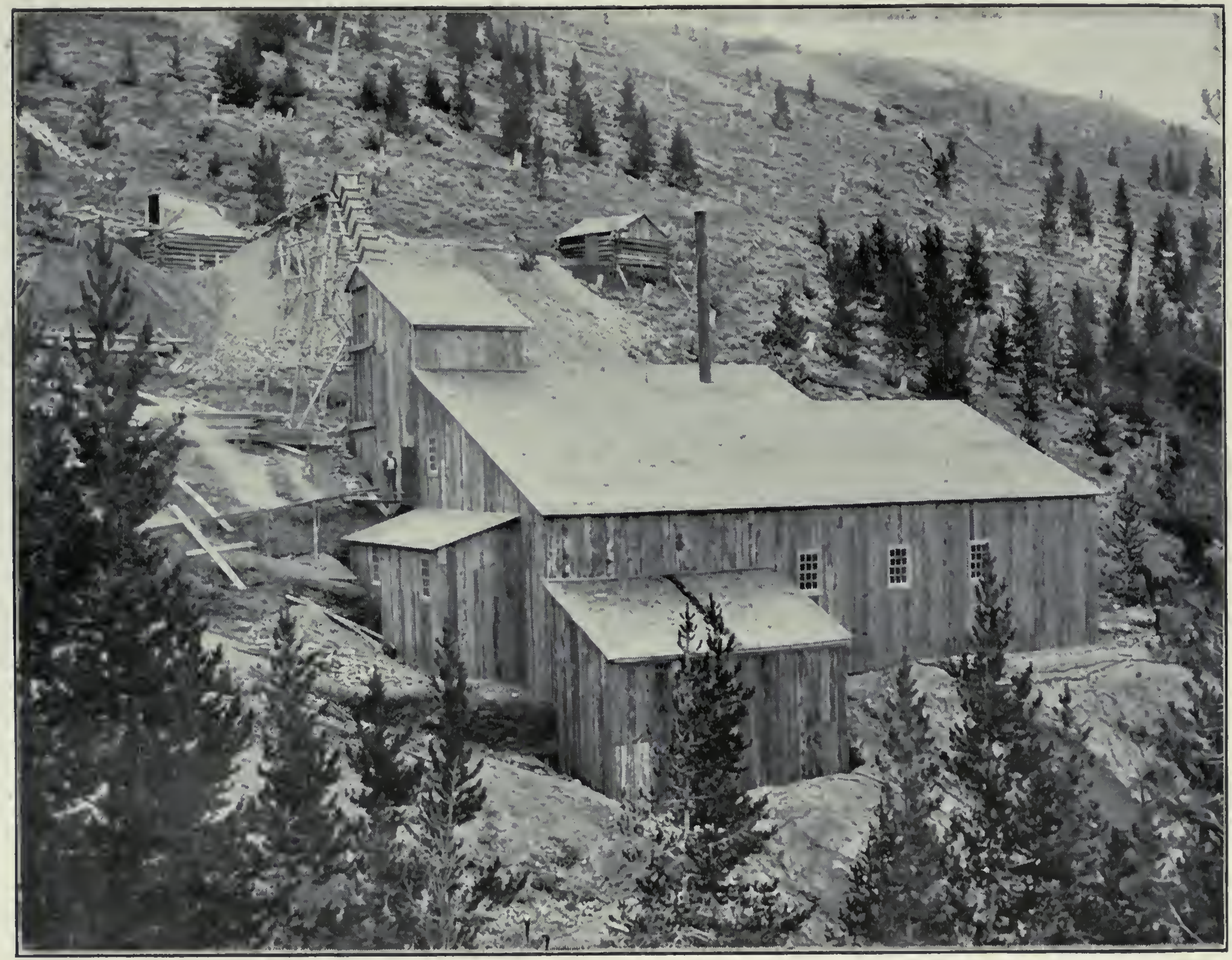
Pacific Group.

This group is owned by the Elling estate and is situated about nine miles from Virginia City. J. H. Pankey is Superintendent.

This property is developed by two tunnels, No. 1 being 1,400 feet in length and No. 2 600 feet. All of this work excepting 300 feet of tunnel No. 1 was done during the past two years. Many hundreds of feet of drifting, cross-cutting and driving upraises was made during the same time. The ore yields gold and silver. Part of the product is shipped for reduction and the less valuable grades are treated in a 30-ton mill operated in connection with this property.

Easton Mine.

Owned by the Elling estate and situated eight miles from Virginia City, J. H. Pankey, Superintendent. During 1901 and part of the present year the property was operated with quite a force of men. Little has been done of late, the greater part of the force being transferred to the Pacific mine. A 30-ton cyanide plant is in course



SHAFTER MILL AT VIRGINIA CITY

of erection for the treatment of the tailings which have accumulated during the years the mill has operated on Easton, and later on Pacific, ores.

Shafter Mine.

The Shafter mine is located at Summit, at the head of Alder Gulch, eight miles from Virginia City, and is owned and operated by Thomas H. Teal. A crosscut 275 feet in length is driven in the mountain to tap the vein, and the vein then driven on for a distance of 1,200 feet. Several chutes of ore of profitable quality were encountered during the progress of the work. The ore is gold and silver bearing and is treated to stamp and plate amalgamation. The tailings are then treated with cyanide, by which combination a high percentage of the values are recovered. The capacity of the plant is 15 tons per day, and is comparatively inexpensive in operation.

The Keystone Nos. 1 and 2, are also being worked in conjunction with the Shafter. These are adjoining claims and are being developed under bond and lease by Mr. Teal.

The Kearsage.

This property is being developed under lease and bond by W. B. Milliard, and is situated at Summit. R. B. Turner is Superintendent.

The vein is opened for a length of 600 feet by an adit tunnel from which a shaft is sunk on the vein 100 feet deeper. This property produces a very high grade gold ore which is shipped to the smelter for reduction.

Toledo Mine.

The Toledo is owned and operated by the Bismark Nugget Gulch Con. Mining Company, Eugene Ring, Jr., Manager. The mine is situated about five miles east of Sheridan. An incline shaft is sunk on the vein to the depth of 300 feet and a tunnel driven 650 feet. The shaft is equipped with a 25 horse power steam hoist and skip. This vein has been worked in an intermittent way for several years, but owing to the excessive cost of transporting the ores the results were generally unsatisfactory. The present company acquired the old Brandon smelter, situated at the mouth of Mill Creek, about one and a half miles from the mine, and completely remodeled it to meet modern requirements. The ore carries gold, silver, and lead. The company intends to treat the product of the Diamond Hitch and Diamond Belt mines, which are located on Wisconsin Creek, in this smelter also. Preparations are being made to open the mine on a much more extensive scale.

Diamond Hitch Mine.

Is owned by the Bismark Nugget Gulch Con. Mining Company. This property is situated on Wisconsin Creek, seven miles from Sheridan. The vein is developed to a depth of 200 feet by an incline shaft and drifted on for several hundred feet. The ore carries gold, silver and lead. A steam hoist and skip comprise the hoisting plant. All the development of any consequence was done during 1901 and 1902. The property now gives promise of developing into a steady producer.

The Diamond Belt Mine.

This claim is located in the near vicinity of the Diamond Hitch and is owned by the same company. A tunnel is being driven on the vein and was in 300 feet, and an upraise made to the surface. The mineralization of the vein is becoming better as the tunnel is extended into the mountain.

Lake Shore Mining Company.

The properties of this company consist of seven adjoining claims situated at the head of Wisconsin Creek, fifteen miles from Sheridan, and near the summit of the Tobacco Root range, at an elevation of approximately 9,000 feet. This property was opened and developed during the past two years. Two parallel tunnels are driven and are respectively 450 and 125 feet in length. These crosscut two gold bearing veins, which are drifted on in the aggregate 500 feet. A 10-stamp mill with four concentrating vanners annexed is conveniently situated to the tunnels. The manager, Mr. E. L. Shafner, is sanguine of developing a large producing group of mines.

Noble Mine.

This mine has been worked intermitently for many years and a large tonnage of ore in the aggregate has been shipped from it. It is developed by crosscut tunnels, the lower, or main working tunnel being 2,200 feet long. An upraise is in course of driving, which starts at a point in the main tunnel 1,700 feet from its mouth. This upraise, at the time of visit, was 700 feet above the tunnel along the course of the vein, an unsual distance to attempt driving an upraise. The work was extremely expensive, requiring the services of a three-drill compressor to supply ventilation and with one miner working in the face of the upraise, requiring from two to three laborers to keep the broken rock away. The values contained in the ores are gold, silver and a small per cent of copper.

Hudson Mine.

The Hudson mine, located near Silver Star, and owned and operated by Dahler and the Largey estate, was very successfully operated during the greater part of 1901 and 1902 by lessees. The mine produces a gold ore which has netted a handsome profit per ton to the operators and the bodies developed yielded a large monthly tonnage. During this time the shaft, an incline, was lowered to the 350 foot level and extensive development done in opening up the vein.

Bowery Mine.

This old property was operated almost steadily for the past two years by two separate partnerships under a working bond from the owner, F. L. Merks. The mine is located near Silver Star, and is one of the very early locations of this section of the State. Since last reported the shaft has been sunk 100 feet lower and a winze sunk from this level an additional 100 feet, giving a total depth on the angle of the vein of 650 feet. The capacity of the combination stamp and cyanide plant has been increased from 20 to 60 tons. At no time has justice been done this property. Operated intermittently by lessees for many years, whose chief aim was to extract all the ore possible at the least cost, and expend as little labor on development as conditions imperatively require, and usually neglecting to timber the workings or make any provisions for the future of the mine, yet it has a recod of production which runs into the hundreds of thousands of dollars, and no reason exists from the present physical condition of the property why, if properly equipped, managed and developed, it could not be made a steady, profitable producer.

Gold Hill Mine.

Owned and operated by H. I. Wilson & Company, of Butte, located six miles south of Whitehall. This mine was purchased by Wilson & Co. in 1901, and development and ore extraction has steadily progressed since. The vein is opened by two adit tunnels of 700 and 1,200 feet respectively. Under the new owners a two-compartment shaft has been sunk from the level of the main working tunnel, and the vein exploited for several hundred feet. The vein produces a medium grade gold bearing iron sulphide, which is shipped for reduction to the Butte smelters. The output has been very large for the amount of ground developed.

East and West Mayflower.

These properties were operated under the one management dur-1901 and 1902. Development was mainly carried on through the East Mayflower. On this property the shaft was lowered 200 feet, which obtains a depth from surface of 1,200 feet. Recently little work has been done on these properties.

Mountain View Group

This group of copper bearing claims is owned by J. C. and Alex. Johnston of Butte, and is situated at Bear Gulch, about twelve miles from Twin Bridges. Developments consist of a shaft, which is sunk 260 feet. After reaching this depth and drifting on the vein the prospects of developing a large mine were so encouraging that it was decided to drive a tunnel at a point on the mountain which would attain much greater depth. This tunnel has now been extended a distance of 1,450 feet, and is expeetcd to strike the vein at about 1,600 feet, tapping it at a depth of 900 feet vertically. This will conclusively demonstrate the worth of the property.

Elgin Group

This group is situated at Rochester, owned and operated by Wilson & Hodgens, of Butte. Work on this property was commenced during 1902. An incline shaft was sunk 200 feet and a steam hoisting plant installed, and the vein drifted on for a length of 500 feet. This group consists of three full mining claims, and is located on a parallel vein to the Watseka. The vein is a strong gold bearing fissure and gives every promise of developing into a good producer, Sinking has been resumed and with the additional depth gained it is confidently expected that a body of merchantable ore will be uncovered.

FERGUS COUNTY.

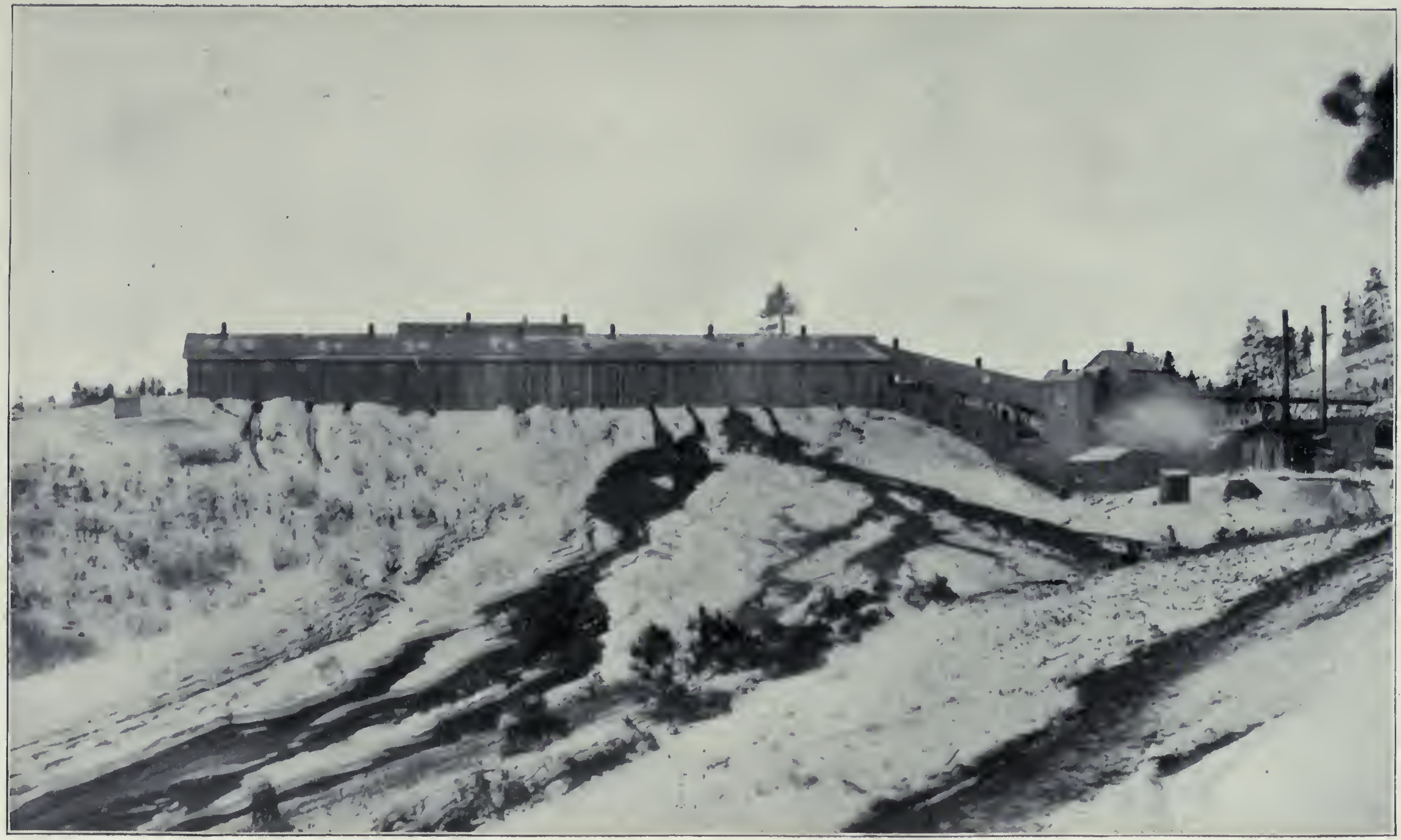
COMPARATIVE STATEMENT OF PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

METAL	1900		1901		
	Quantity	Value	Quantity	Value	Increase or Decrease
Gold, fine ounces	12,580.065	$260.065 43	33.618.681	$694,959 81	**$434,894 38
Silver, fine ounces***	6,136.15	7,933 61	8,746.10	11,308 09	**3,374 48
Lead, fine lbs	8,392	366 73	....	....	**366 73
Total values......	....	$268,365 77	....	$706,267 90	**$437,902 13

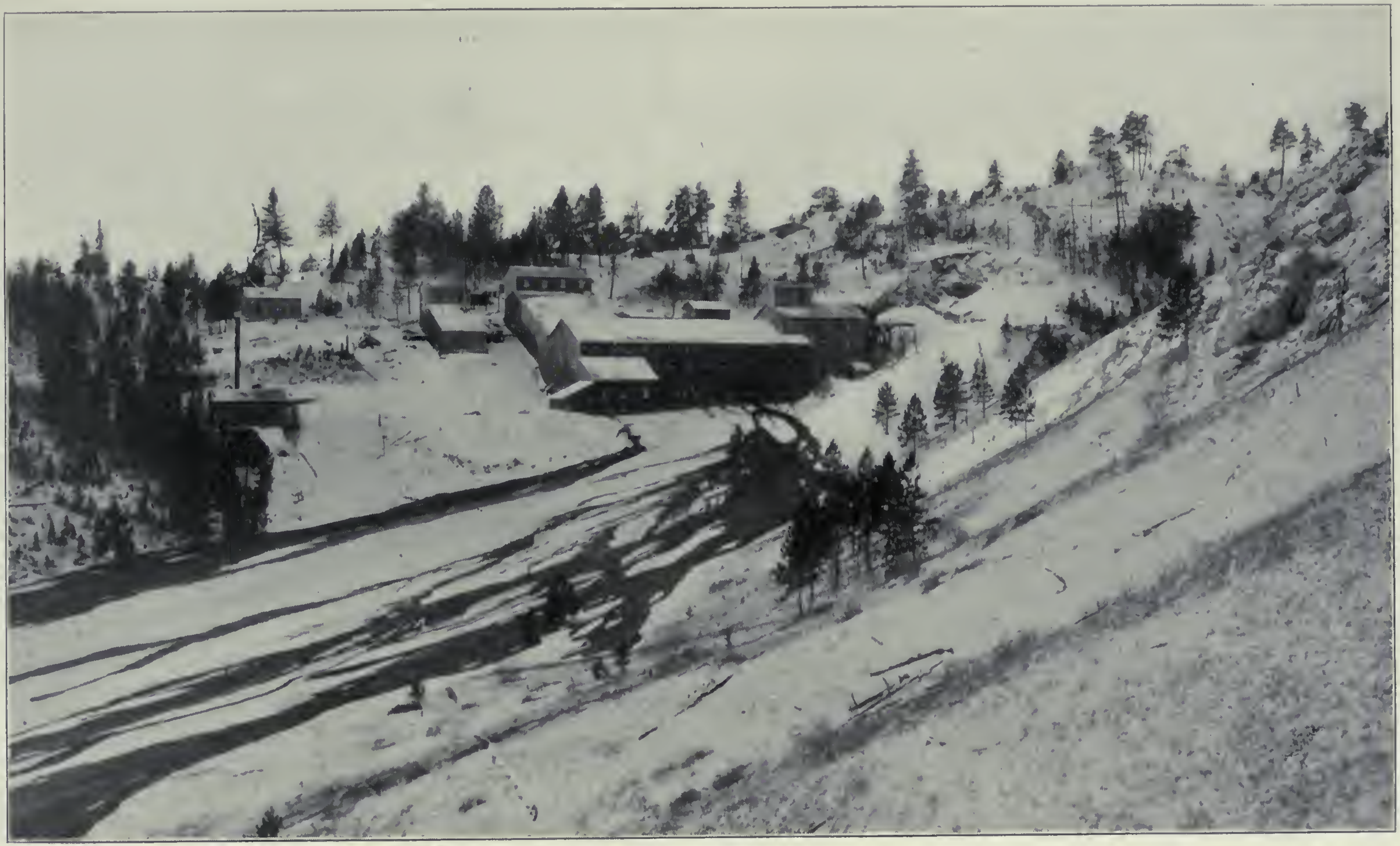
*** Coining value. ** Increase. * Decrease.

Fergus County as a Gold Producer.

Up to within the past few years the principal sources of wealth in this county were considered to be in its wonderfully rich farming and graxing lands.



KING-BARNES MILL, NORTH MOCCASIN MOUNTAINS, FERGUS COUNTY



KENDALL MILL, NORTH MOCCASIN MOUNTAINS, FERGUS COUNTY

This county is 125 miles long by 110 miles wide and contains nearly nine million acres. There are four separate ranges of mountains wholly within its boundaries and also a portion of another range. The North and South Moccasin ranges are in the western portion of the county, the Judith range in the central part, the Snowy range in the southeastern part and a portion of the Belt range in the northwestern part.

The foothills of all these ranges are well watered and the soil is very rich, making it an ideal farming and stock country.

Precious metals have been known for the past twenty-five years to exist in all of these ranges and in a great many of the gulches some very good placer diggings have been and in a few of them are still being worked.

The Spotted Horse and McGinniss mines, were the first quartz mines that were opened up in the county, and these two mines have produced in the neighborhood of three million dollars in gold bullion and neither of them has been worked to a depth greater than five hundred feet. The Spotted Horse mine is still a producer and it is believed by conservative mining engineers that both of these properties, if properly managed and explored, will be good producers for a number of years to come.

The ores of these two mines are usually found on the contact between lime and porphyry and some of the ore has been of very high grade samples of sylvanite and calvarite having been found that would assay as high as fifty thousand dollars to a ton.

The greater portion of the ores from these two mines was worked out before the advent of the cyanide process and as a great deal of the gold was in a chemical state, and could not be saved by amalgamation, less than half of it was saved in treating it by stamps and the balance of the values went down the gulches in the tailings, and there have been as high as five separate cyanide plants working at a time, successfully treating these tailings and some of them will continue to run for several summers yet.

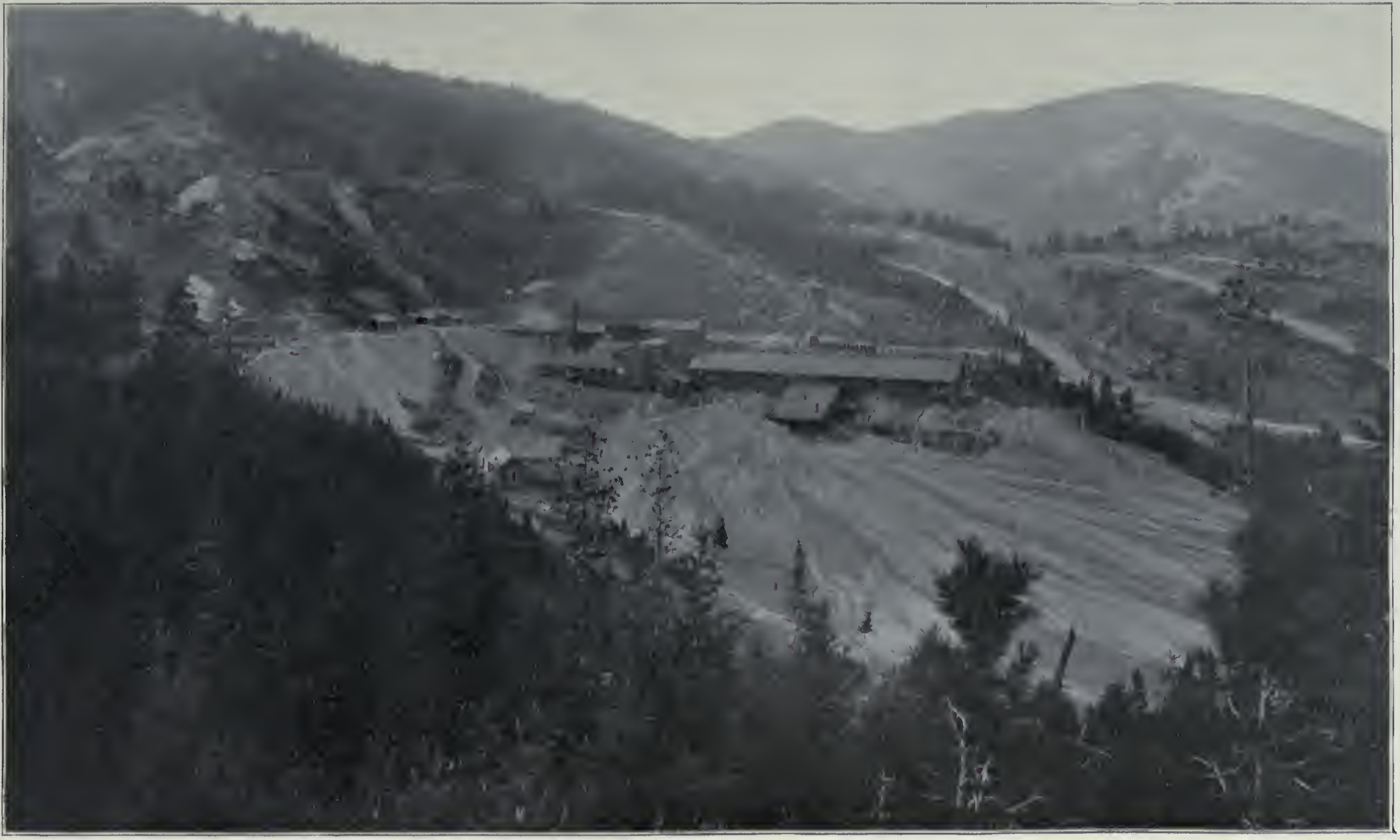
The third cyanide plant in the United States was built in Gilt Edge, this county, in 1892, in the Judith mountains, but owing to the process not having been yet perfected, the plant was not a success. These properties were worked by several different parties with different success until 1897, when they were all re-organized and passed into the hands of the Great Northern Mining & Development Company. This company built a modern 150-ton cyanide plant and the property has been a financial success to the present time. The property was sold on October 1st to the Gold Reef Mining Company, and the new company is enlarging the mill to nearly double its former capacity and is also adding a large roasting plant for roasting the black, unoxidized ores that have lately been encountered in the lower levels. A new ten drill compressor plant is being installed on the property and a new water supply is being brought in from Whiskey gulch, a distance of three miles, and conveyed to the mill by a five-inch wood pipe. This property has large reserves of ore blocked out and will continue to be a good producer for a number of years to come.

In 1898 the New Year Gold Mining Company put a 100 ton cyanide plant in operation on their property in the Judith mountains and since then the plant has been increased to a 250 ton plant. They have also installed a ten drill compressor plant and an aerial tramway, over one mile in length for transporting the ore from the mines to the mill.

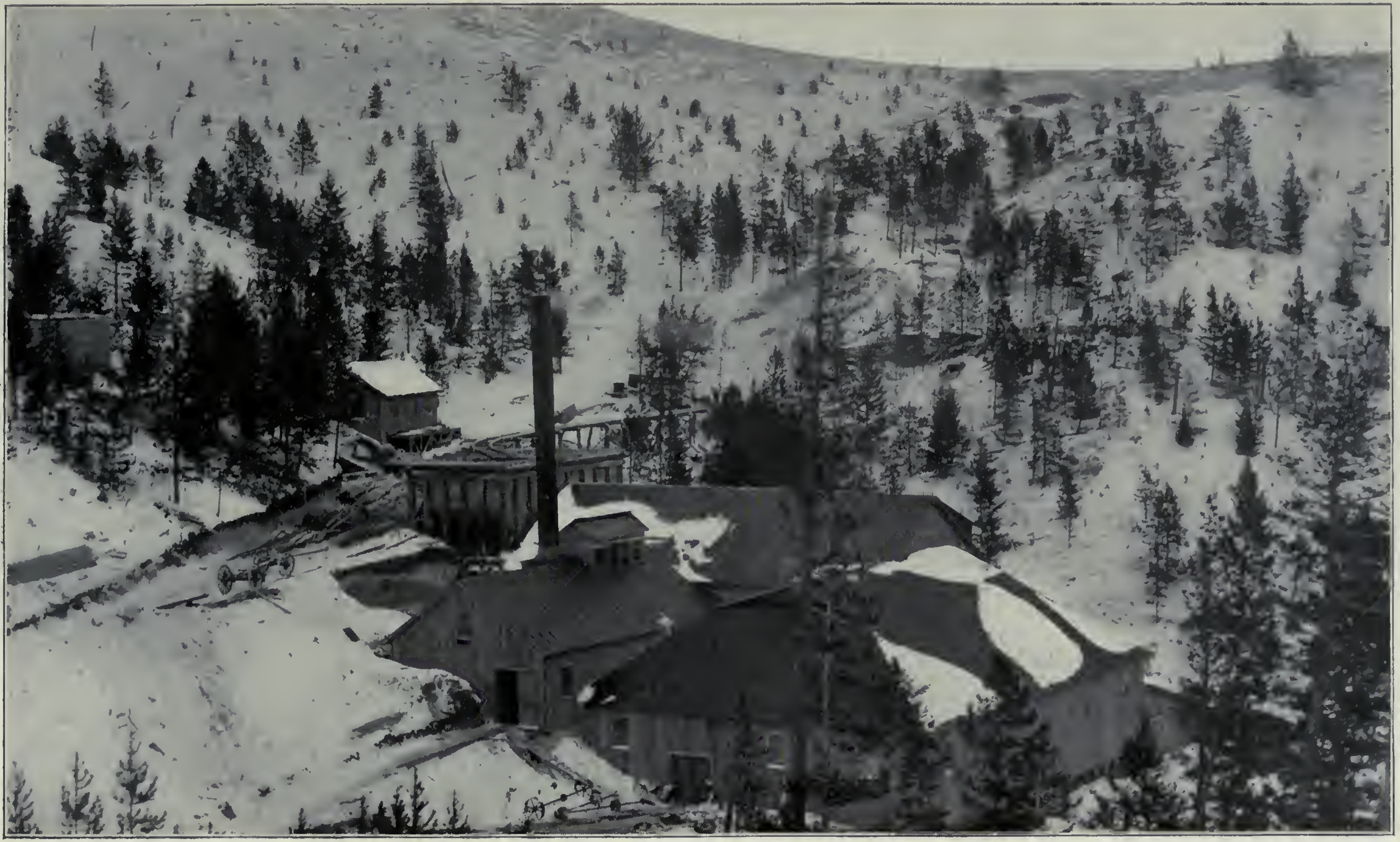
In 1899 a 200 ton cyanide plant was built on the Whiskey Gulch mines in the Judith mountains, by the Central Montana Mines Company. This mill has run steadily up to within a month ago, when it was shut down for the purpose of re-organizing the company, and also for the pushing of the development work further in advance of the requirements of the mill.

In 1900 H. T. Kendall built a 100 ton cyanide mill on his properties on the North Moccasin mountains, and after operating the same for a few months, sold the property to the Kendall Gold Mining Company, for $400,000.00, and after a small amount of development work, that company built a new mill of 350 tons capacity, and by taking the waters out of Warm Spring, a large spring between the North and South Moccasin mountains, they have developed nearly 500 horse power and carry the power to the mill by electricity. This mill is now running to its full capacity and the development work that has been done on the property has shown up a chute of ore 750 feet long and 300 feet deep, averaging over 100 feet in width and the bottom of their main shaft is still in a high grade ore.

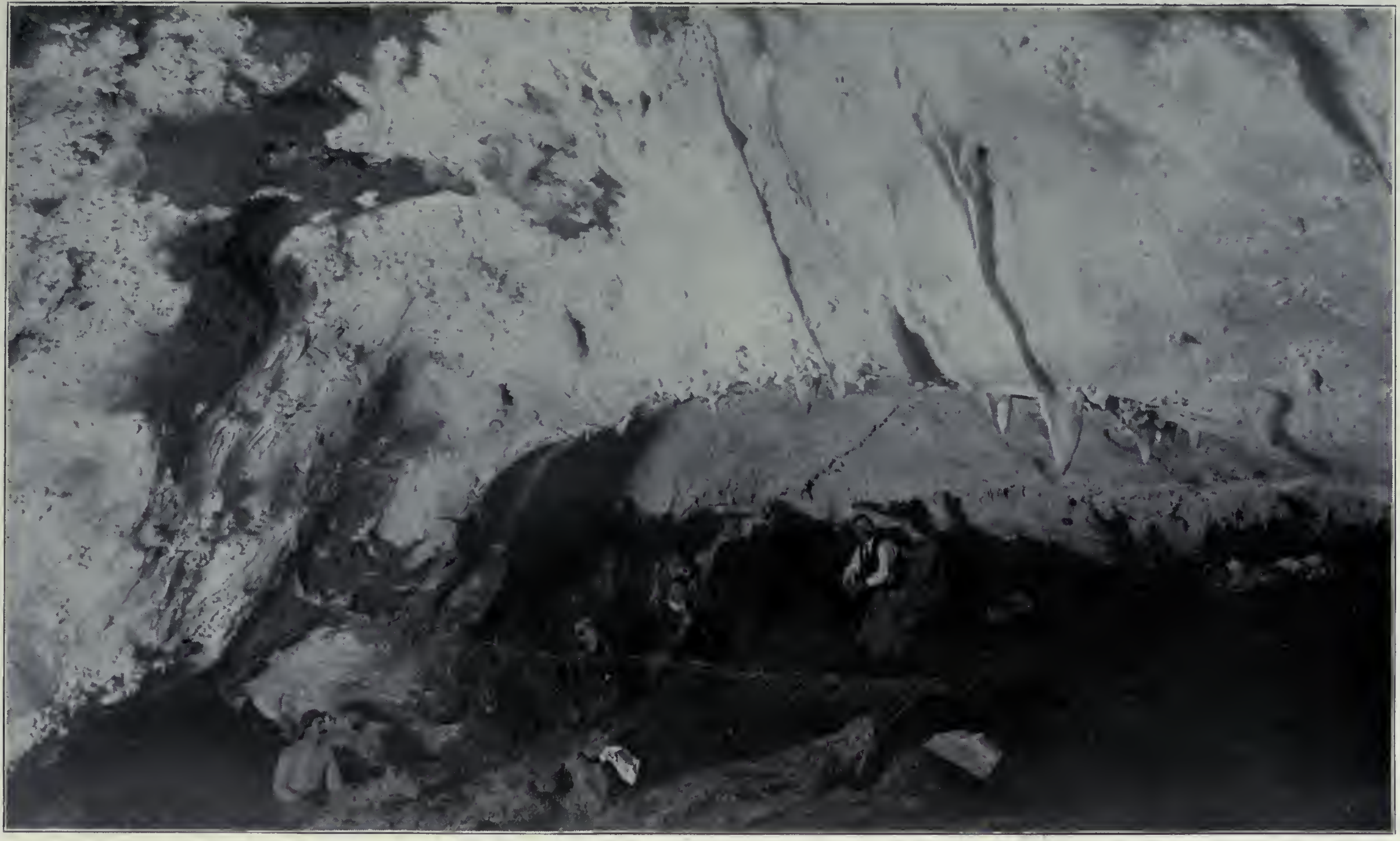
In 1901 a 110 ton cyanide plant was erected on the Barnes-King property and since then this plant has been doubled in capacity and it is highly probable that the owners will erect a similar plant on the north end of the property this coming summer. A new hoisting engine has just been placed in operation on this property and is of sufficient size to sink 1,000 feet and development work is being pushed as rapidly as possible. This property is in the North Moccasin mountins and is about half a mile north of the Kendall mines



GILT EDGE MINES AND MILL, JUDITH MOUNTAINS, FERGUS COUNTY



WHISKEY GULCH MILL, JUDITH MOUNTAINS, FERGUS COUNTY



NATURAL CAVE IN GILT EDGE MINES, ABOUT 1½ ACRES, FERGUS COUNTY

BI-METALLIC MILL, PHILIPSBURG

BALD BUTTE MINING COMPANY'S MILL AT BALD BUTTE

WATSEKA MILL, ROCHESTER

BI-METALLIC HOIST, GRANITE

and on the same ore zone, the company owning over 6,000 feet along the contact, with good ore showing up the whole length of it.

This county is now producing about $110,000.00 per month in gold bullion and with the extensions under way in the present mills and the new mills that are contemplated in the near future the output will be greatly increased.

New Mines Sapphire Syndicate Mines.

These mines were operated during 1901 and 1902 on a larger scale than during any of the previous years. The company owns eleven claims on the vein or dyke and for a distance of about one and a half miles the ground has been tested with satisfactory results. Heretofore the larger part of the material was worked by sluicing, the dyke being worked in places by this means to a depth of 75 feet. The part of the dyke which permitted this kind of mining is about exhausted and during the past year the material has been extracted in the same manner as is followed in the metalliferous veins. Tunnels have been driven and shafts sunk, the material taken to the surface and allowed to disintegrate before being run through the sluice boxes, where the gems are recovered.

The group of sapphire mines formerly owned by Burke and Sweeney, situated about three miles from the property of the New Mines Sapphire Syndicate at Yogo, was sold to a St. Louis company during the present year and a force of men put to work to develop the property. Next year we may look for the property to add materially to the production of precious stones in this state.

GRANITE COUNTY.

COMPARATIVE STATEMENT OF PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

METAL	1900		1901		
	Quantity	Value	Quantity	Value	Increase
Gold, fine ounces	7,013.688	$144.985 80	10,566.047	$218.419 58	$73,433 78
Silver, fine ounces***	1,732,528.95	2,240,037 43	1,827,868.32	2,363,304 49	123,267 06
Copper, fine lbs	....	....	7,198	1,160 10	1,160 10
Lead, fine lbs	....	....	6,464	280 15	280 15
Total values	....	2.385,023 23	....	$2,583,164 32	$198,141 09

*** Coinage value.

The principal mines operating in Granite County during the past two years were the Consolidated Granite and Bi-Metallic at Granite, the Hope, at Philipsburg, Sunrise, near Stone Station, the Mitchel & Mussigbroad group. The Grant & Hartford, and the McGone and Anderson group at Garnet.

The Consolidated Granite-Bi-Metallic company has operated without interruption and given employment to a large force of men in the mines, mill, concentrating and construction departments during the past two years. The mines are maintained in the same excellent condition as noted in previous reports. The shaft of the Bi-Metallic was sunk 100 feet, giving a total of 1,800 feet and very important and costly improvements made in the power and mechanical departments. The continued operation of these properties under the most discouraging and adverse conditions caused by the constant decline in the price of their product, (silver), is due more to the economies effected in providing cheap electrical power than to the ability of the mines to produce silver profitably at the present market price with former mining charges obtaining. Since the completion of the power dam and installation of the generating plant at Flint Creek in 1900, the electric power has displaced steam as the motive force in operating every mechanical plant to which it could be advantageously applied. All mining operations requiring power are run with compressed air generated by electric force. The mill and concentrator are operated with it, the use of steam being practically confined to that required for operating the hoisting engines. The concentrator which was designed to handle 150 tons, has been greatly increased and perfected in its details. These improvements in the mine and mill plant and the substitution generally of the cheaper power have called for enormous expenditures of capital and have required years to complete and perfect. The saving effected, however, in every department makes it a profitable investment. The old officers continue to direct the affairs of the company, with Paul A. Fusz as president, Werner Zeigler, superintendent and James Willoughby, foreman.

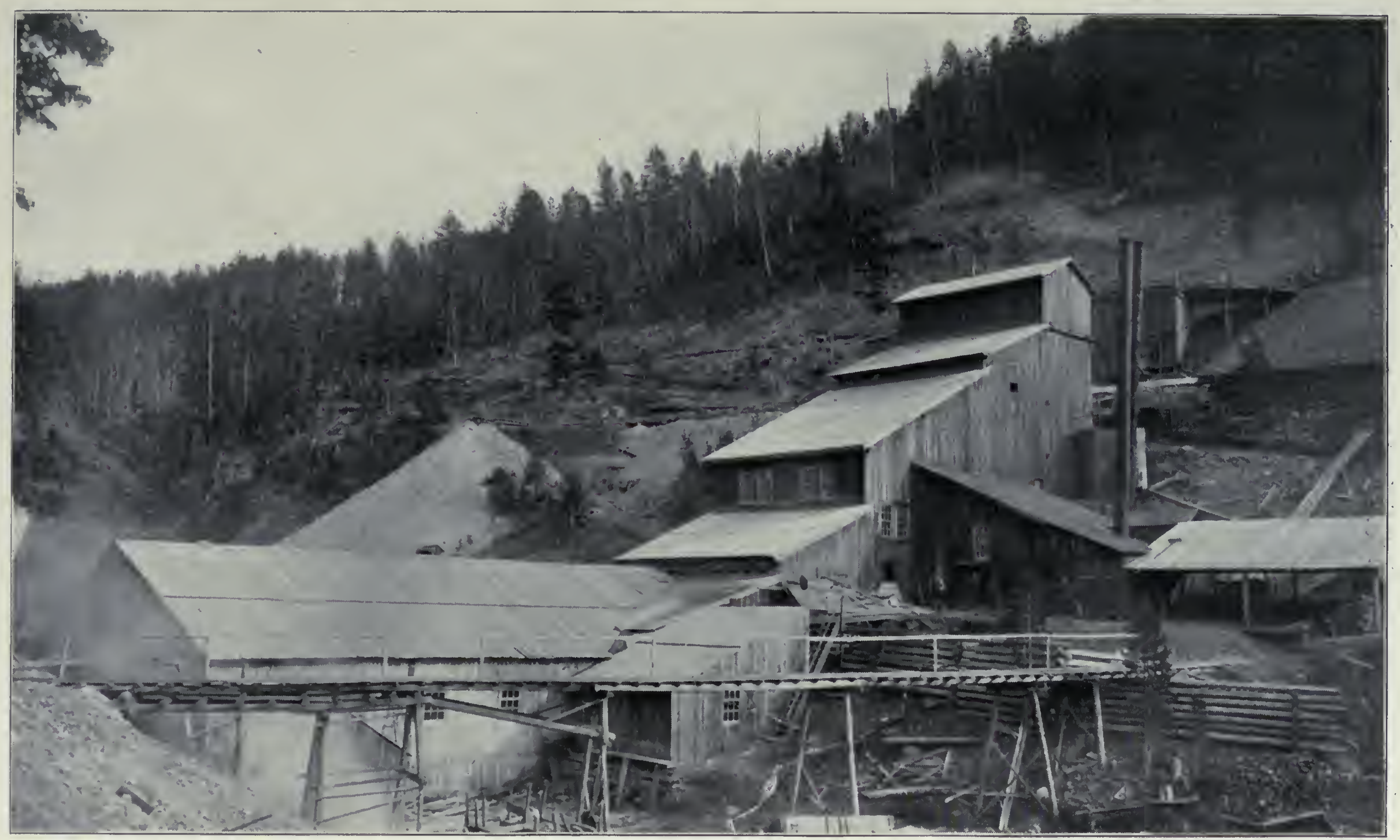
Good Hope Mining Company.

Operations on this old property during the past two years have been confined to prospecting for new bodies of ore, driving tunnels and working on the tail ends of former large chutes of ore, occasionally encountering a small chute of ore in the new development. Werner Zeigler is manager of the property and J. R. Lucas, superintendent.

Sunrise Mine.

Is owned by the Henderson Mining Company, located seven miles from Stone Station; Frank D. Brown, manager.

This property is quite extensively developed, two tunnels being



VIEW OF DR. MUSSIGBROD'S MILL AT GARNET

driven on the lode, developing a large tonnage of milling ore. Active work has been under way for some time on the property putting it in shape to produce a good tonnage for a long period. This in anticipation of the exertion of a mill to treat the product. The mill, a very complete one of 20 stamps, Wilfly tables and slum tanks, was recently completed. In all its details of construction and appliances it is perfect. Every possible contingency, in so far as a loss of values, has been provided against and every device that would promote the cheap handling of the product without impairing efficiency is supplied.

The Lead King-Emmet Group.

This group consists of twelve contiguous claims, located at Garnet, twelve miles north of Bearmouth station, on the N. P. Railway. The property is owned by Dr. Peter S. Mussigbrod and the Mitchell estate, and has been a constant producer for several years. Of the twelve claims in the group seven of them have been developed more or less extensively. Of these the Red Cloud, on account of its situation to the milling plant, is best developed. During the past two years a large amount of development has been done on the Robert Emmet claim. An incline shaft 200 feet deep was sunk and the vein drifted on for 500 feet, opening up an ore body 300 feet in length. Several of the other claims have been worked sucessfully by lessees who, in the aggregate, have produced a considerable tonnage of high grade ore. A material percentage of the vein is shipping ore, which is treated mostly at the Butte smelters. The lower grades of material are treated in the works, which is part of the property, and consists of a ten-stamp mill with plate amalgamation, followed by concentration over vanners and Wilfley tables, and the tailings and slimes from this process are run over a large area of California slime tables, the whole process recovering a satisfactory percentage of the values.

Grant & Hartford.

This property is located at Garnet and is one of the old locations of the district. The owners during many years did little to develop the claim aside from running a tunnel on the vein for a length of 200 feet, but without proving the merit of the lode. Early in 1902 a company of Butte men secured a lease and bond on the property and started a shaft, following the vein from the tunnel. This was sunk 200 feet and showed the vein to be permanent and of fair size, carrying values in gold, which netted a good margin of profit. Drifting on the vein has been in progress since sinking was completed with results that encourage the belief that the property will develop into a permanent producer.

McGone & Anderson Group.

Situated at Garnet, owned by McGone & Anderson. This group consists of four claims, three of which are located on the same vein. The property is developed by three tunnels, the shortest being 150 feet in length and the longest 400 feet. All of these tunnels are driven on the vein and develop a considerable tonnage of fair milling ore, besides producing some ore of shipping quality. The development on this group has not gotten below the oxide zone. The indications seem to show that if developed deeper a much better grade of ore would be encountered.

The Nancy Hanks and Shamrock mines, in the Garnet district, worked but little during the past two years. Lessees tried both properties, but with indifferent success. Both at present require development.

JEFFERSON COUNTY.

COMPARATIVE STATEMENT OF PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

METAL	1900		1901		
	Quantity	Value	Quantity	Value	Increase or Decrease
Gold, fine ounces	5,235.327	$108,223 81	4,472.870	$92,462 43	*$15,761 38
Silver, fine ounces***	69,053.25	89,280.97	169,687.01	219,593 30	**130,312 33
Copper, fine lbs	40,063	6,486 19	128,196	20,661 35	**14,175 16
Lead, fine lbs	....	....	66,404	2,877 95	**2,877 95
Total values	....	$203,990 97	....	$335,595 03	**$131,604 06

*** Coining value. ** Increase. * Decrease.

Early in 1901 the Longmaids began operations on the Elkhorn mine at Elkhorn, the corporation being known as the Elkhorn Silver Mining Company, J. Henry Longmaid, manager. A silver mill was erected and the old dumps milled and later the ores of the mine were extracted and milled. In 1902 a large body of iron ore carrying silver values was encountered and large shipments were made to the East Helena smelter. Owing to the low price of silver at present prevailing, the mines have closed, but there exist in the property large ore reserves which can be extracted and shipped profitably with the price of silver ranging near sixty cents per ounce.

The main incline shaft has reached the depth of 2,300 feet and is equipped with a one hundred horse power hoist. When in operation the mine has given employment to from 100 to 125 men.

During its operation by the present company the mine has produced 400,000 ounces of silver, which was sold at an average of fifty three cents per ounce, and one hundred and fifty-nine and one-half ounces of gold, upon which there was realized $10,800.00.

The Benjamin mine, in the same district, was worked during 1901 and a portion of 1902, producing from fifty to seventy tons of iron ore, which was shipped to East Helena as flux.

Liverpool.

The Liverpool Mining Company, owning the Liverpool and Washington mines in Lump gulch, during the summer of 1902 installed a new hoisting plant having capacity to sink 1,000 feet and sinking is now in progress on the main shaft, which has reached a depth of 475 feet. The vein is in granite, the strike of which is nearly east and west, the dip being to the north. This mine has produced very high grade lead-silver, grey copper and silver glance ores.

Thomas Cruse has been operating the Kennedy mine, between Holmes and Lump gulch, during the season and some high grade lead-silver ore has been shipped.

Throughout 1901 and to November, 1902, the Peck Concentrator has been running off the tailings dump of the old Alta mine at Corbin.

The Alta mine has been operated in a small way by lessees.

The Daly brothers worked their mine in the town of Wickes during 1901, shipping ore carrying 12 per cent of copper and considerable silver. The mine has been recently acquired, under bond, by Martin Mulvihill and associates, who have installed a steam hoist and are sinking the shaft, which was sunk to the depth of 200 feet.

Minah Mines.

There were employed at these mines, which are situated three miles west of Wickes, during 1901 an average of twenty miners and the output aggregated about 3,000 tons of shipping ore, which carried about twenty ounces of silver and $12.00 in gold to the ton. During the year a parallel vein was opened which contained ore showing in shipments as high as 200 ounces of silver and $25.00 of gold to the ton and some copper. During the present year the mines have been worked principally by lessees.

The Blue Bird mine, in the same district, was worked in 1901 and the present year by lessees and regular shipments of lead-silver ore have been made to East Helena.

C. W. Fleming, owner of the Bell mine in the Warm Springs district, east of Clancy, actively operated this mine during 1901 and the spring of 1902, shipping from ten to fifteen carloads of lead-silver ore per month.

The Latch brothers and Huffaker are operating a property in the same district with the Bell mine, shipping from two to three carloads of lead-silver ore a month to the East Helena smelter.

Occidental Mines.

The Occidental Mining Company, of St. Paul, has been employing from seven to ten men in developing its properties, situated on Blue Bird range, above the old Gregory mines. Large bodies of concentrating ores have been opened and recently in running a cross cut tunnel a body of shipping ore was encountered carrying lead, silver and copper.

Eva May.

The Eva May Mining Co., during 1901, added considerable machinery to the plant on its mines, seven miles north of Basin, which is equipped with a steam hoist and a 150-ton concentrator. The main shaft has reached the depth of 650 feet. Ore shipments have been made to Butte which netted $50.00 to the ton, carrying as high as 13 per cent of copper.

Cataract Copper Company.

This company is oprating a group of seven claims in the Cataract district. The main tunnel, on the Bullion claim, has been extended a distance of over 1,400 feet, opening up large bodies of concentrating and shipping ore carrying lead and silver and considerable values in copper.

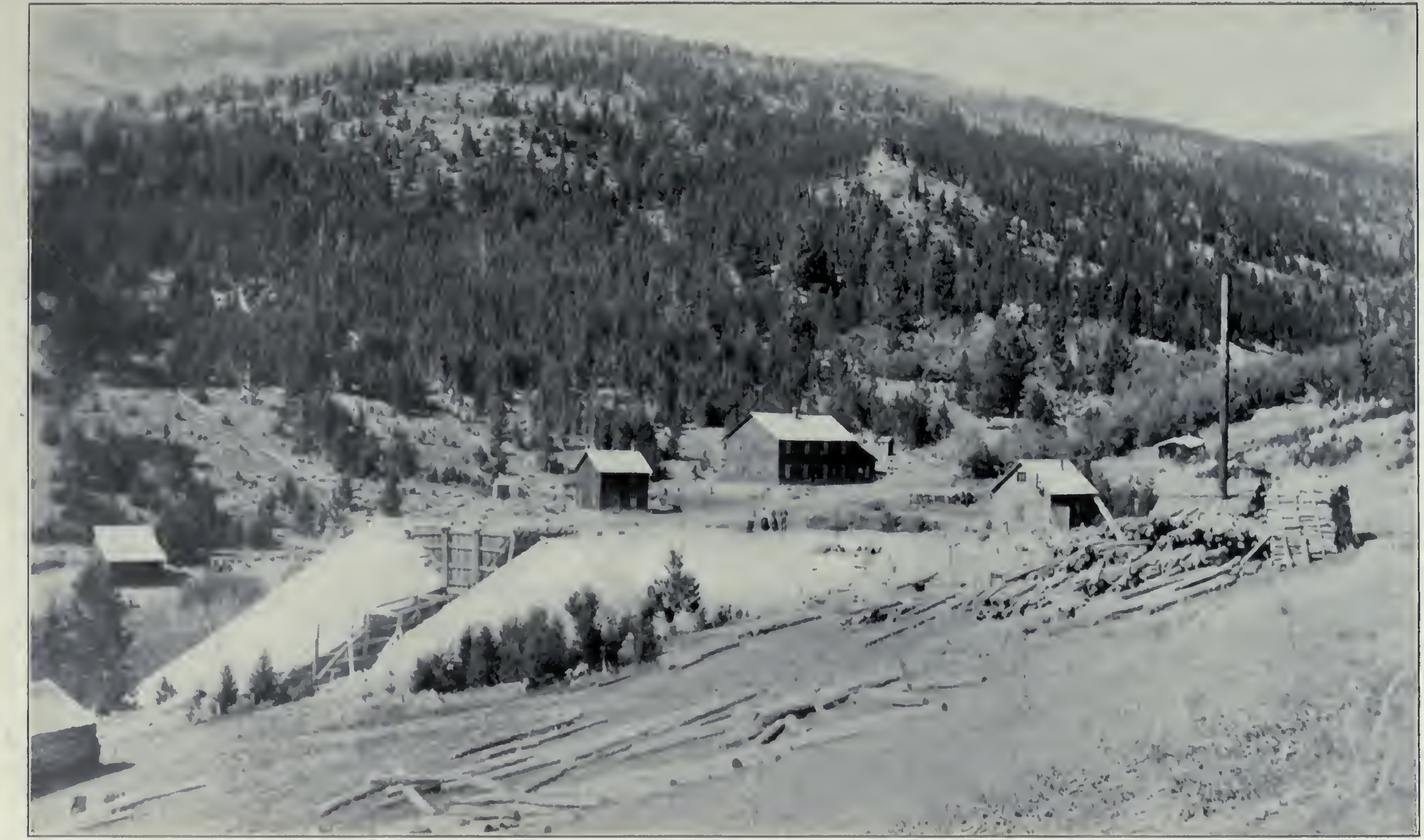
Ada.

The Ada mine, located at the head of Rocker gulch, has been a steady shipper of high grade gold ore throughout 1901 and 1902.

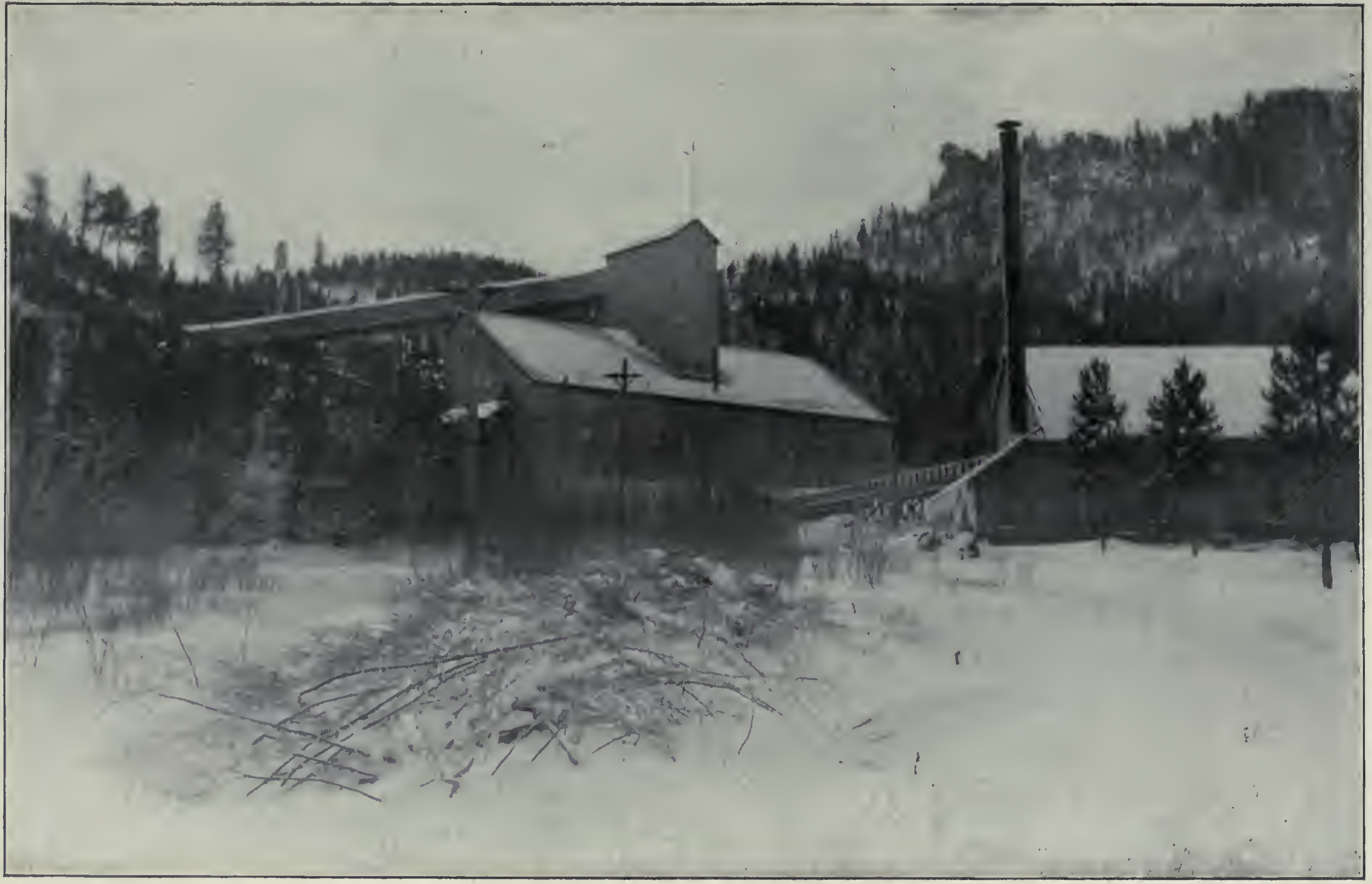
The Comet and Rumley mines, at Comet, are being operated by lessees, two four horse teams being constantly employed hauling ore.

Grey Eagle.

This mine, located at the head of High Ore gulch, has been in continuous operation during 1901 and 1902. The mine produces high grade ores carrying gold and silver and is developed by three tunnels, No. 3 being 1,400 feet in length. From this tunnel a winze has been sunk to the depth of 200 feet.



GREY EAGLE MINE, HIGH ORE GULCH, JEFFERSON COUNTY



BIG INDIAN MINE AND MILL, JEFFERSON COUNTY

Buckeye.

In the summer of 1901 Davis and Judson acquired the Buckeye mine, which is located in the Upper Basin district. A new shaft was sunk to the ore body and considerable shipping and concentrating ore extracted. The concentrator was in operation during a portion of this season.

Basin Concentrator.

Upon the destruction of the concentrators of the Montana Ore Purchasing Company, located at Butte, during the past summer, this company acquired the concentrator belonging to the Basin and Bay State Mining Company, situated at Basin. This concentrator the M. O. P. Company has completed and greatly enlarged and the entire product of the Butte mines operated by this company is now being treated in the Basin concentrator. The operation of this mill is very advantageous to the mine owners of the Basin and Cataract districts, as they are able to market their low grade ores profitably, which could not be done formerly.

The Big Indian.

A notable addition to the mining industry of Jefferson county during 1902 has been the construction and operation by the Big Indian Mining Company of a sixty stamp mill on the company's mine, located five miles southeast of Helena.

This mine consists of a body of low grade, free milling gold ore over 400 feet in width. It has been worked for eleven years as an open quarry, which has extended to a depth of 150 feet from the surface, the ore being profitably treated in a fifteen stamp mill.

The present mill is wholly operated by electric power from the Missouri River Power Company's plant at Canyon Ferry, on the Missouri river, sixteen miles distant. In all its details the mill is equipped with every known appliance to lessen the cost of treatment and attain a close saving of values, the president and general manager, Allen C. Mason, estimating that the ore can be extracted and treated at an expense not to exceed sixty cents per ton.

BROADWATER COUNTY.

COMPARATIVE STATEMENT OF PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

METAL	1900		1901		
	Quantity	Value	Quantity	Value	Increase or Decrease
Gold, fine ounces	6,644.593	$137,355 93	5,238.107	$108,281 28	*$29,074 65
Silver, fine ounces***......	108,644.53	140,469 69	175,462.66	226,860 81	**86,391 12
Lead, fine lbs..	1,024,804	44,783 93	2,407,036	104,320 94	**59,537 01
Total values	....	$322,609 55	....	$439,463 03	**$116,853 48

*** Coining value.. ** Increase. *** Coining value. * Decrease.

The most active mining district in Broadwater county during 1901 was the Winston district, located south of Winston station on the line of the Northern Pacific Railroad. During 1901 and 1902 the Iron Age mines have been in constant operation by the owners, Dodge and Hill. Regular shipments have been made to East Helena smelters. The ores are iron oxides and sulphides and carry gold values which net a good profit. The principal incline shaft, which has reached the depth on the dip of the vein of 500 feet, is equipped with a steam hoist.

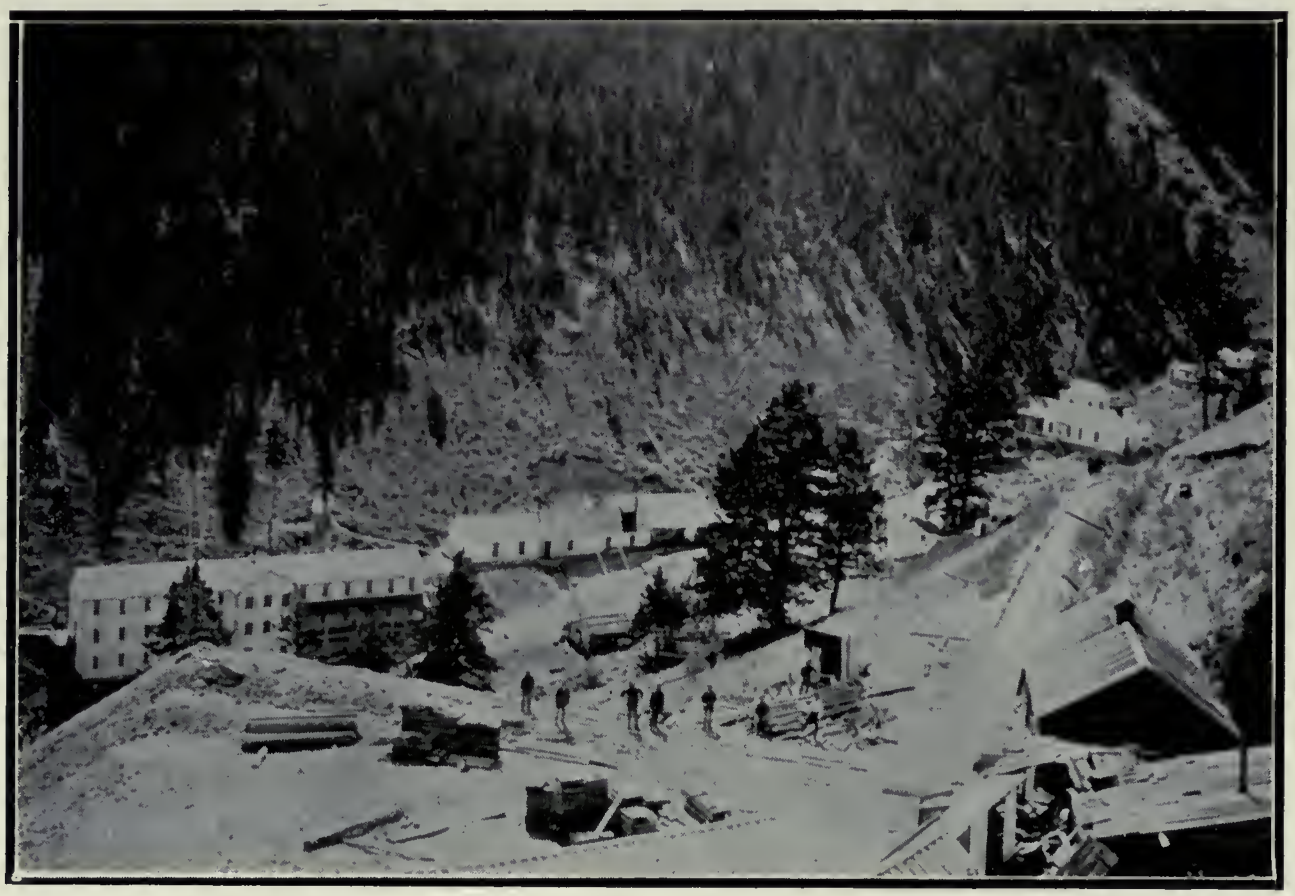
During the early part of 1901 the Stolen Sweets mine, in Iron Age gulch, was operated and considerable high grade ore was shipped.

The H. & H. mines during 1901 and 1902 have been worked chiefly by lessees, the ore being shipped to East Helena.

East Pacific Mine.

The East Pacific mine, owned and operated by Robert A. Bell, was in full operation during 1901 and the spring of 1902, giving employment to an average of eighty men. In 1901 a winze was sunk from No. 4 tunnel to the depth of 150 feet and levels run on the vein east and west, 110 and 120 feet respectively. The bottom of the winze reached a depth of over 900 feet below the apex of the vein. There is a station in tunnel No. 4, at point where winze is sunk, equipped with a thirty horse power hoist, operated by compressed air. Work on the mine is suspended pending construction of a concentrator to treat the second class ores, of which there are above 10,000 tons on the dump. The first class ore is a high grade galena carrying gold and silver of about equal values.

The Stray Horse Mine, on Weasel Gulch, has been worked dur-



VIEW AT THE EAST PACIFIC MINE, WINSTON, TAKEN FROM NO. 3 TUNNEL

Large Building to the left is the Bunk House. Center Building is Boarding House.
Building to the extreme right is Office and Store.

ing 1901 and 1902 by lessees and quite regular shipments of ore have been made.

Schule & Goodman have, during the current year, been operating the Quartet mine, at the head of White Horse Gulch, and have shipped this fall six car loads of lead-silver ore which netted handsome returns.

Peter the Great.

The Merritt Brothers have, during 1901 and 1902, been operating the Peter the Great Mine, on Eagle Gulch, employing from 12 to 20 men. Regular shipments have been made of silver-lead ores which also carry substantial values in gold.

Keating-Blacker.

The Keating mine near Radersburg, was worked during 1901 and steady shipments were made of sulphide ore carrying $14.00 to $22.00 to the ton.

In the fall of 1902 the Horseshoe Mining Company, of Deadwood, acquired the Blacker mine, adjoining the Keating, and have a force of men employed in extracting ore which is shipped to the company's smelters at Deadwood, Dakota.

Hard Cash—Last Chance.

A. M. Easterly during 1901 and 1902 has been actively operating the Hard Cash and Last Chance mines, located four miles south of Radersburg. The ore in both mines carries high values in gold and carload shipments have been regularly made to Butte. The Hard Cash is developed by tunnels and the Last Chance by shaft. The mines are owned by Easterly and Main.

A. K. Edwards, representing Butte people, has been developing a group of copper claims, known as the Toston mine, located four miles south of Radersburg, developments reaching the depth of 200 feet.

The Confederate Gulch Mining Company had a very successful run in 1901 and 1902, the clean up of 1902 exceeding that of any previous season.

Considerable successful placer mining was also done on Indian Creek.

PARK COUNTY.

COMPARATIVE STATEMENT OF PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

METAL	1900		1901		
	Quantity	Value	Quantity	Value	Increase or Decrease
Gold, fine ounces	9,778.754	$202,144 78	9,433.012	$194,997 66	*$7,147 12
Silver, fine ounces***	1,927.73	2.491 77	2,994.16	2,871 24	**379 47
Total values	....	$204,636 55	....	$197,868 90	*$6,767 65

*** Coining value. ** Increase. * Decrease.

Precious metal mining in Park County during 1901 and 1902 made very satisfactory progress. The chief mining center is at Jardine, formerly Bear Gulch, where the properties of the Bear Gulch and Gold King Mining companies are situated, as well as numerous partially developed and promising prospects, which bid fair to increase the output of the yellow metal from the county materially.

Operations in the Contact and Independence districts have been steadily prosecuted and exploration carried to a point which leaves no room for further doubt regarding the permanency and value of the ore bodies of these districts. In Emigrant Gulch the Nolan brothers, of Livingston, have been engaged in developing a likely looking group of gold bearing claims. They have equipped the property with a modern mill of ten stamps and concentrating appliances.

Bear Gulch Mining Company.

Owns nineteen claims, four of which are thoroughly developed by tunnels ranging from 250 to 900 feet in length, Development on this group has been vigorously prosecuted during the two years just past. An immense amount of new ground has been opened, greater depth secured by tunneling lower on the hill and the ore reserves thus maintained well ahead of production. The twenty stamp mill was run continuously, treating sixty tons per day, the greater part of the values in which is recovered on the plates and practically all of the remainder is saved as concentrates on the vanners and Johnson tables. For sometime past there has been litigation pending between the Bear Gulch and the Gold King Mining companies, the latter company owning the Revenue mine, which adjoins the Bear Gulch Company's property. They also own a new forty stamp mill which was erected two years ago, but has not been operated pending the settlement of the questions involved between the companies. Recently all questions in dispute were adjusted and henceforth these properties will be operated jointly and under one management. It is expected that the Revenue mill will be put into service at once, treating the ores of the combined groups and the properties developed and operated in the interest of the whole.

The Milwaukee-Montana Mining Co.

The properties of this company are located at Contact, twenty-five miles south of Big Timber, and consist of a group of gold-bearing claims which are developed by a series of tunnels ranging from 100 to 300 feet in length. The property is equipped with a five stamp mill run by water power and the ore is transported from the mine to the mill over a wire tramway 1,800 feet long. J. M. McNulty is general superintendent.

Standard Mining Company.

Located at Contact. This property is opened by two tunnels, No. 1 125 feet and No. 2 314 feet in length. An upraise connects both tunnels. The ore is gold and almost entirely free milling and is treated in a five stamp mill owned by the company A gravity surface tramway 1,400 feet in length is used in transporting the ore from the mines to the mill. C. R. Murdock is general manager.

Hidden Treasure Group.

This property is situated about sixty miles south of Big Timber and has been operated successfully for several years under the management of Mr. E. H. Cowles. The ore is gold bearing and is reduced in a ten stamp mill owned by the company.

The mine and ten stamp mill owned by the Nolan Brothers, situated at Emigrant Gulch, was run continuously during 1901 and part of 1902. This property has produced considerable gold. The mill closed some time ago pending development of the mine.

CASCADE COUNTY.

COMPARATIVE STATEMENT OF PRFRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

MATAL	1900		1901		
	Quantity	Value	Quantity	Value	Decrease
Gold, fine ounce	2,001.155	$41,367 54	1,422.857	$29,413 06	$11,954 48
Silver, fine ounces***	781,448.35	1,010,357 46	250,294.41	323.612 97	686,744 49
Lead, fine lbs	2.164,475	94,587 55	852,288	36,938 16	57,649 39
Total values	....	$1,146,312 55	....	$389,964 19	$756,348 36

*** Coining value.

Like every distinctively silver producing district the progress and development of Neihart has suffered a severe check. The principal product of its mines no longer commands a market value that justifies the development of prospects, no matter how promising, nor warrants the expenditures necessary for new exploration in the mines which have made the district famous, so that it may be said that the development of the district has been suspended. There are several mines still operating, but work is mainly confined to the extraction of ores that were opened up in the course of past development. Among these is the Florence, which has operated continuously during the past two years, producing a good daily tonnage. Considerable new development was done during 1901 and the early part of the present year on the upper part of the vein. Tunnels Nos. 1, 2 and 3 were extended to a length of 750 feet respectively, developing in the course of the work an extensive chute of high grade ore. Work in the lower part of the mine through the shaft was confined mainly to stoping.

Big Seven Mine.

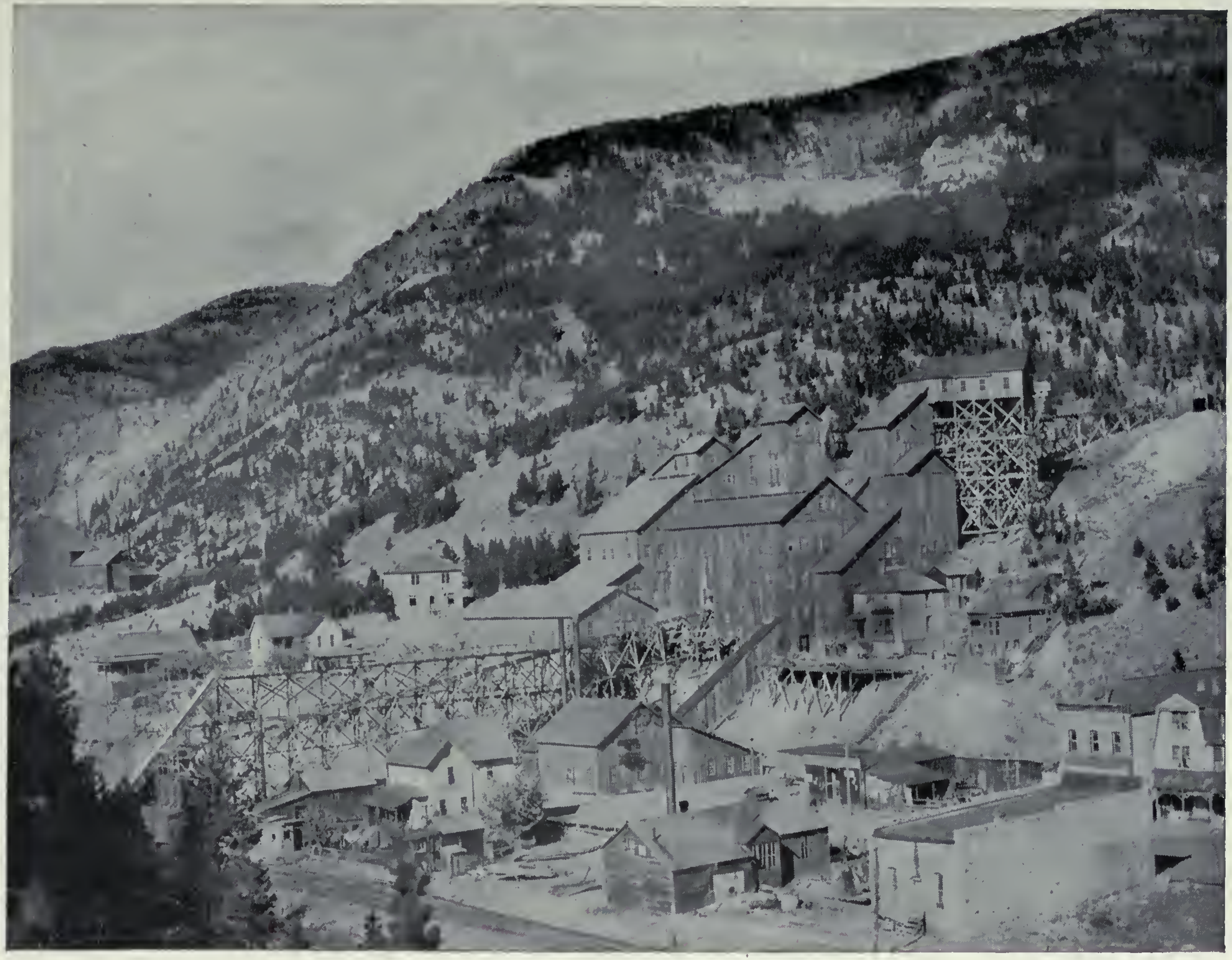
The Big Seven, the ores of which contain a liberal perecntage of gold, was operated during 1901 and part of 1902 by lessees. No new development was undertaken, work being confined to reopening the old stopes and prospecting small sections of ground which had been left as having little value during former operations. Considerable ore was mined and shipped during the time of lease.

Silver Belt.

This property was puchased by D. L. S. Barker in 1900 and under his management has developed into a profitable producer during the past two years. The vein is tapped by a cross-cut tunnel 300 feet in length and drifted on for 700 feet. This drift gains a depth of 300 feet on the vein and has developed a chute of high grade brittle and ruby silver ore several hundred feet in length, from which regular shipments have been made during the past two seasons.

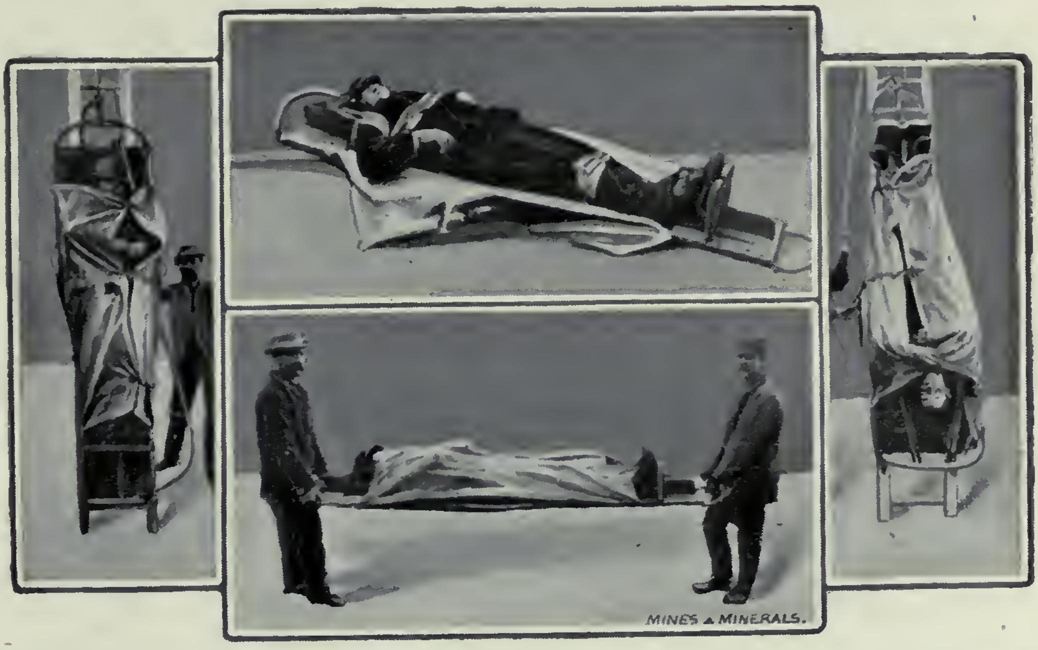
Hartly.

This mine was opened by the owner, William Miller during the past two years. It is a silver property carrying a small percent of lead and is developed by a cross-cut tunnel 460 feet long and the vein drifted on for a length of 500 feet. In drifting on the vein a productive chute of ore was developed which has yielded a large output. The workings are connected by an upraise with surface and are safely timbered.



CONCENTRATOR AT NEIHART

FLORENCE MINE AT NEIHART



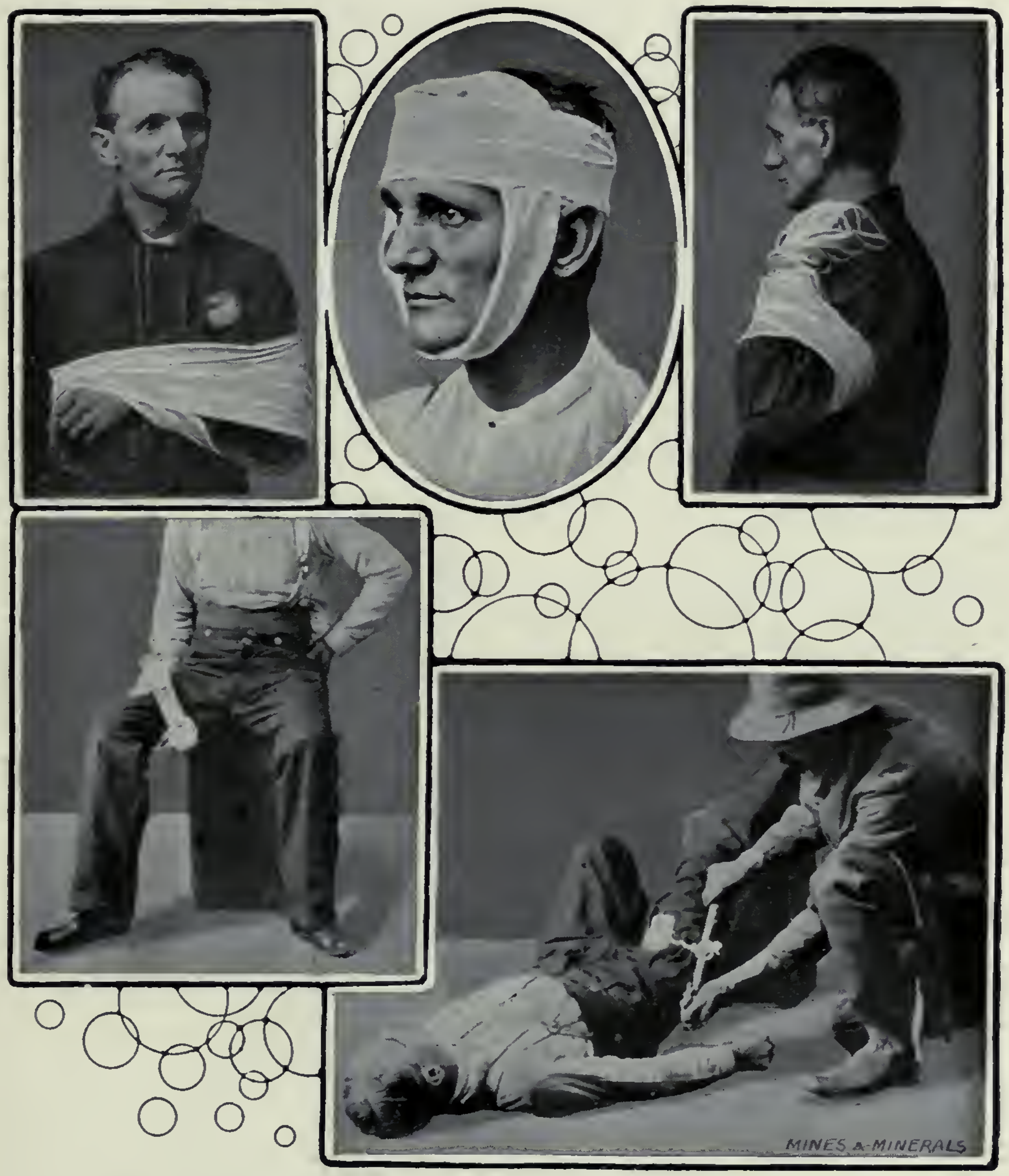
Litter in Upright
Position ready for
Hoisting.

Patient Strapped to Litter.

Litter and Burden supported by two bearers.

Litter in Reversed
Position.

Fig. 4



Round Stick under arm to compress arteries in arm bound to side.

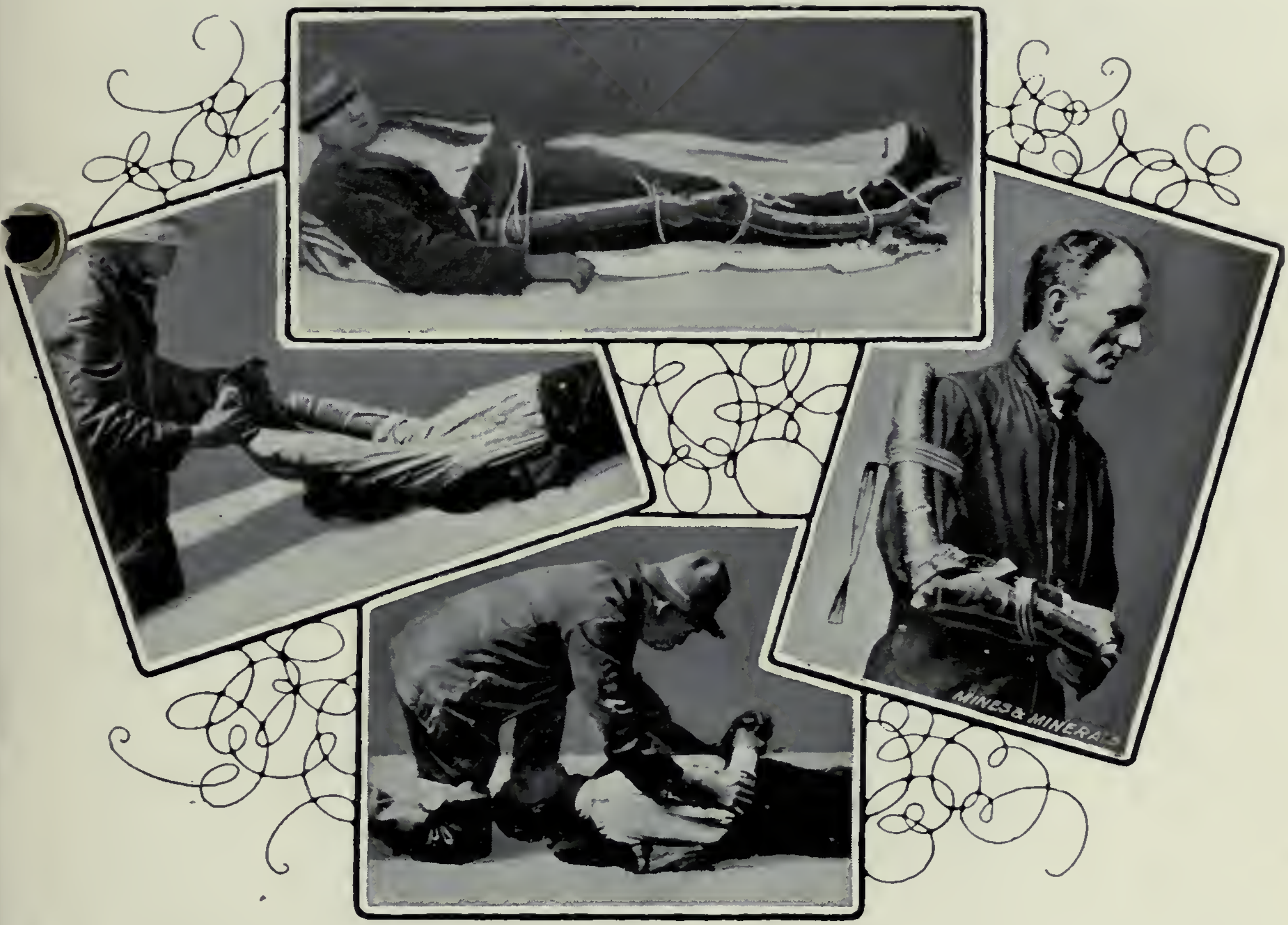
Head Bandage to apply pressure in bleeding from scalp wounds.

Forcible Flexion of the forearm making pressure at the bend of elbow.

Round Stick bound to thigh for pressure on artery.

Compression by Loop and stick controlling blood supply to foot and leg.

Fig. 2

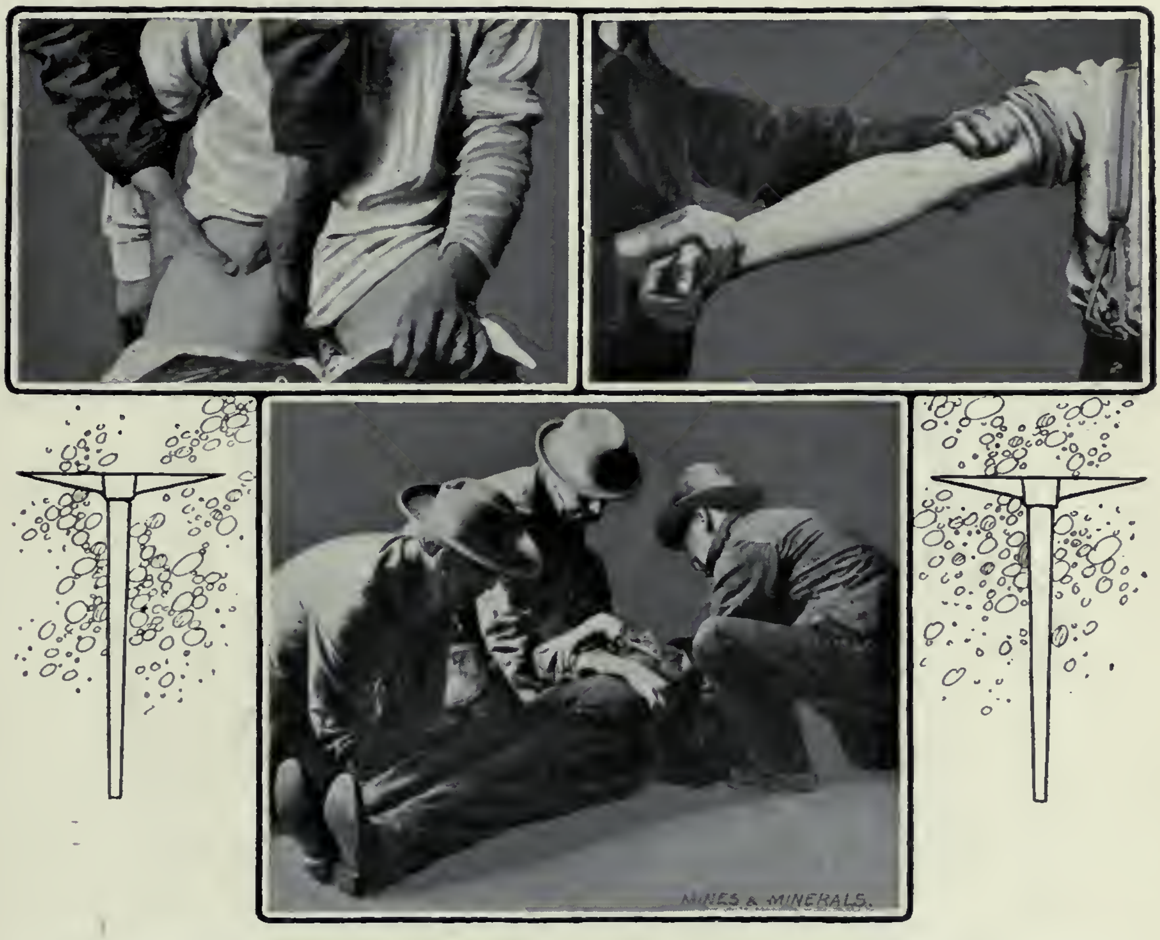


Temporary Splint for thigh.

Artificial Respiration. First Position. Angular Splint for fractured arm.

Artificial Respiration. Second Position.

Fig. 3


MINES & MINERALS.

Thumb Compression of large Arteries of Thigh to stop bleeding.

Finger Compression of Arteries to stop bleeding in palm of the hand.

Lifting an Injured Person.

Fig. 1

Ripple.

The Ripple mine is another property which has produced a fair tonnage of high grade silver-gold ore during the past two years. The property was developed under J. C. C. Barker. Several short cross-cut tunnels tap the vein at various depths and several chutes of extremely rich ore have been encountered. On account of the gold values contained this property is considered one of the most likely in the district.

The Galt mine and the Benton group were in the hands of lessees altogether, the respective veins being divided into sections and these sections leased to parties of from two to four men. Through this system quite a tonnage of ore has come from these properties which otherwise would not have been obtained. Excepting for a few lessees mining in the silver-lead camp of Barker is at a standstill.

FLATHEAD COUNTY.

COMPARATIVE STATEMENT OF PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

METAL	1900		1901		
	Quantity	Value	Quantity	Value	Increase or Decrease
Gold, fine ounces	1,350.132	$27,909 70	2,247.87	$46,455 55	**$18,545 85
Silver, fine ounces***	67,181.86	86,861 39	40,186.09	51,957 79	*34,903 60
Lead, fine lbs	803,585	35,116 66	300,000	13,002 00	*22,114 66
Total values	....	$149,887 75	....	....	*$38,472 41

*** Coining value. ** Increase. * Decrease.

The mineral resources of Flathead County have not attracted the attention of capital which they merit. Several districts in this county offer unequalled inducements to capital for the development of profitable producing mines. The mineral showings of the Cabinet Range in gold, silver and lead are not excelled anywhere and the lodes which are developed to any extent prove them to be strong, persistent fissures. Discoveries of promising copper bearing lodes have been made on the north fork of the Flathead river and in the northern part of the county. The Libby and West Fisher Creek mining districts show a steady improvement since last reported on. Two additional stamp mills have been erected in the West Fisher district and development prosecuted quite generally.

Fisher Creek Group.

The Fisher Creek group of gold mines is owned by the Fisher Creek Mining Company, John Branagan, manager. The properties are developed by five adit tunnels varying in length from 250 to 450 feet. All of these tunnels are connected by workings and are thoroughly ventilated and timbered. The vein varies in width from four to ten feet, having a dip of between ten and twenty degrees to the south. The output is nearly thirty tons per day and is treated in a ten stamp mill to plate amalgamation and the tailings run over tables and vanners recovering the base part of the ores.

American-Kootenai Mining & Milling Co.

This company is operating two claims, the Gold King and the Gold Bug, located on West Fisher Creek, thirty-five miles south of Libby.Developments are carried on through two tunnels of 250 and 350 feet respectively. The ore carries gold chiefly, with small lead and silver values and is treated in a ten stamp mill owned by the company. An aerial tramway 2,240 feet in length transports the ore from the mine to the mill. W. J. Beager is manager.

Blacktail Mining Company.

The properties of this company are developed by several short tunnels from which considerable ore has been mined. A ten stamp mill was erected during 1901, which was operated but a short time on account of the mine not being sufficiently developed.

Libby Mining Co.

This company owns a very promising claim upon which a small amount of work has been done and a two stamp mill erected to test the ore prior to deciding on the process best adapted to the recovery of values.

Rustler Mining Company.

The mines of this company comprise the group which is best known as the Snowshoe group, located at the head of Snowshoe gulch, eighteen miles south of Libby. The property has lain idle since the summer of 1900. Early in the present year Mr. D. P. Bowers, who formerly operated the property successfully as lessee, organized a company and purchased the group and immediately resumed operations and commenced developing the property on a large scale. Among other developments in progress is the sinking of a deep shaft from the level of the lowest tunnel and the thorough exploiting of the vein below the present workings. The property is opened by five tunnels varying in length from 400 to 1,700 feet and a shaft 350 feet deep, 200 feet of which was sunk the present year. Besides pushing the development in all directions, the concentrator is kept constantly running, which requires a daily output of 150 tons. Mr. D. P. Bowers is the resident manager.

Silver Cable.

Considerable development work was done on this property during the past year. It is confidently expected that sufficient ore was developed to justify the starting of the fifty ton concentrator, which is erected on the property and keep it in action steadily.

POWELL COUNTY.

STATEMENT OF PRODUCTION OF METALS DURINGS YEAR 1901. IN 1900 THIS COUNTY WAS A PART OF DEER LODGE COUNTY.

Description.	Quantity.	Value.
Gold, fine ounces	7,838.787	$162,021 43
Silver, fine ounces***	81,694.74	165,625 53
Total value	....	$327,646 96

*** Coining value.

The greater part of the mining work done in the territory now included in Powell County during the past two years was in the nature of development. Several promising gold prospects are undergoing development in the Coloma district. At Ophir considerable interest has been excited by the good copper showings and several properties were tested in a small way during 1901 and 1902. The Helmville and Ovanda districts also received some attention and the work done encourages belief that in the near future many producing mines will be developed in these sections.

Ontario Group.

Operations on this property were suspended several years ago owing to contentions arising between the stockholders. During the present year the property was transferred to a new company, known as the Boston & Seattle Mining Company, and operations resumed. The new company contemplate improving and developing the plant and mines. The concentrator was entirely renovated and important additions made to the plant with a view to increasing its efficiency. A tunnel was started lower on the hill which will attain several hundred feet of additional depth and at the same time develop other veins which are known to exist, but which could not be tapped by the present workings. All of the present workings are on the Ontario claim and consist of a cross-cut tunnel 800 feet in length from which is sunk a shaft 320 feet deep. This old mine was for many years one of the best producers in the Rimini district and its deepest workings are but 440 feet below the surface.

Emery.

Owned by the Emery Mining Company, W. I. Higgins, manager. Considerable development was done on this mine during the past year. A new shaft 450 feet deep was sunk and the plant generally improved. The ore carries gold, silver and lead, large shipments of which are being constantly made to the smelters. The Emery has been one of the steadiest producers in this country.

Sierra.

This is a promising looking property which was partially developed during the present year by M. E. Woolridge. It is lcoated at Garnet and developed to a depth of 150 feet by an incline shaft. The ore carries gold principally, with some silver and copper.

MEAGHER COUNTY.

COMPARATIVE STATEMENT OF THE PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

METAL	1900		1901		
	Quantity	Value	Quantity	Value	Decrease
Gold, fine ounces	168.446	$3,482 09	89.893	$1,858 05	$1.624 04
Silver, fine ounces***	255,610.35	330,486 11	240,005.30	310,309 88	20,176 23
Lead, fine lbs......	4,500,000	196,650 00	2,502,000	108,350 00	88,300 00
Total values	....	$530,618 20	....	$420,517 93	$110,100 27

*** Coining value.

Mining in Meagher County during the two preceding years was inactive. At Copperopolis the properties operated by the late Marcus Daly were closed down during 1901 and did not resume again until the middle of the present year, when a new company was organized by the former manager, W. W. McDowell, and active development has been progressing since that time. Work at the silver-lead camp of Castle was confined to a few lessees who are staying with the old camp in hope of conditions coming about which will be more favorable to the lead-silver interests.

North Pacific.

Is located at Copperopolis and operated by the Copperopolis Mining Company, W. W. McDowell, manager. During the year the shaft has been lowered 125 feet, making a depth of 625 feet.

Drifts are run from the various levels aggregating 2,000 feet. The present plan of development contemplates sinking several hundred feet further in order to fully test the merit of the vein at depth.

Home Copper Mining Company.

This company operated under a working bond a group of copper bearing claims at Minden and did a large amount of development, sinking a shaft 330 feet and driving several hundred feet of drifts on the vein. Recently a very heavy flow of water was encountered which, I am advised, necessitated a temporary shutdown.

CHOTEAU COUNTY.

COMPARATIVE STATEMENT OF THE PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

METAL	1900		1901		
	Quantity	Value	Quantity	Value	Decrease
Gold, fine ounces	1,643.623	$33,976 70	74.862	$1,547 54	$32,429 16
Silver, fine ounces***	1,811.05	2,341 55	30.60	47.32	2,294 23
Total values	....	$36,318 25	....	$1,594 86	$34,723 39

*** Coining value.

Alabama Group.

This group, consisting of twenty claims, is situated on the east end of the Little Rockies, five miles from Landusky. Operations have been carried on in a small way for several years, during which time the property has produced a large aggregate tonnage of very high grade gold ore. In the course of past operations immense bodies of medium and low grade ores were developed which remain untouched in the mines, as the owners had no mill or plant in which they could utilize this class of product. During the past summer the group was examined by Mr. E. W. King, of Lewistown, who was for many years manager of the Great Northern Mining and Development Company's mines at Gilt Edge, and who later developed the King-Barnes group in the North Moccasin mountains and was the first that successfully applied the cyanide treatment to the recovery of the low grade gold values contained in the ores of the Judith and North Moccasin mountains. The examination resulted in his taking over the property and organizing a company under the name of the Alder Gulch Mining Company. Since acquiring the property development on the mine has been vigorously prosecuted. A new shaft is being sunk which is now down 400 feet and the mines put in shape to produce an output of at least 100 tons per day. A cyanide plant of 100 tons capacity is nearing completion which, when ready for the reception of ores, will be one of the completest in the state.

MISSOULA COUNTY.

COMPARATIVE STATEMENT OF THE PRODUCTION OF METALS FOR THE YEARS 1900 AND 1901.

METAL	1900		1901		
	Quantity	Value	Quantity	Value	Increase
Gold, fine ounces	3,229.399	$66,757 60	3,349.788	$69,246 26	$2,488 66
Silver, fine ounces	151.39	195 74	845.28	1,092 89	897 15
Total values	....	$66,953 34	....	$70,339 15	$3,385 81

*** Coining value.

Nearly all of the precious metals produced in Missoula County during the two preceding years were won from placer deposits. Metalliferous mining, which for several years has shown an active spirit, is again resuming an active tone and should, in the very nature of conditions. No region in this or any of the mining states offers to the prospector, miner and capitalist a field where the prospects for success are any better than is to be found in the region traversed by the Coeur d'Alene branch of the Northern Pacific railway. Between Missoula and Wallace, Idaho, a large number of prospects and partially developed properties were in active operation during the past year, the prospects being exceedingly bright for the development of some paying mines from the number. Those developed to any extent are the Tarbox and Boston group at Saltese; the Amador, on Cedar Creek; the Little Pittsburg; the King and Queen; the Saint Regis Mining and Milling Company's property near St. Regis and the Silver Cliff at Saltese.

GALLATIN COUNTY.

Montana Corundum Company's Mines.

Located twenty-three miles from Belgrade and consists of four claims as well as the mineral rights to several thousand acres of agricultural lands. Several shallow shafts have been sunk on the vein, besides numerous short tunnels and surface cuts and pits along the outcrop for a length of one and one-half miles, demonstrating the continuity of the ledge. The product has been subjected to severe tests and found to fulfill all the requirements of a high grade abrasive. A separating and concentrating mill to treat the product was completed in November and the property is now enlisted as a peramnent industry.

Corundum was also discovered in April of the present year on section 31, owned by J. V. Blankenship, located fourteen miles southwest from Bozeman. Four shafts have been sunk and thirty feet of drifting done. Also two tunnels run of thirty-five and one hundred feet respectively. Good showings of commercial corundum have been developed in each of the seven veins which are known to outcrop on the company's property.

TETON COUNTY.

The "Ceded Strip," as it has become known, was purchased several years ago by the government from the Blackfeet Indians for $1,500,000, the purchase being made for the purpose of opening the district to the development of its mineral resources. Since the opening and appropriation of the lands under mineral entries during the past couple of years there have been two companies prosecuting development and some of the points where considerable work has been accomplished bear evidence that while mines have not as yet been develoepd, there is ample evidence that more complete and deeper development will bring to view the ore bodies that are being sought for and that have been confidently believed to exist.

The "Strip" is traversed northwest and southeast by two great parallel leads that cut directly through the successive mountains and that carry more or less copper, gold and silver on the surface, in some places the outcrop being very rich in the former metal. The rocks of the district are igneous and extremely ancient and lie in place horizontally and strata upon strata in distinct character, their position being clearly visible and rising almost perpendicularly from 1,500 to 7,000 feet above the heads of the gulches. The leads are true fissures with a slight southerly dip.

The "Cracker" or the most westerly lead, on which the development has secured the most depth, has a foot wall of diorite tinged with iron oxide and the hanging wall is black slate. Although the character of the formation changes by reason of the different strata, the lode remains intact and seems to carry equal values, when the differences caused by oxidization are taken into account.

On the surface of the lead on the Boulder Creek side there is some rich copper ore on the surface and at one place an open cut exposes a considerable surface, all of which is heavily mineralized with bornite. Below this and lower down upon the vein the Imperial Company has run a tunnel along the lead a distance of about 500 feet, encountering in the length of the tunnel more or less mineralized rock and streaks of glance that zigzag through the gangue encased in white quartz. The face of the tunnel is now showing copper glance in the cleavage and it is probable that the tunnel is nearing the ore body that is exposed by the open cut above and ahead of it, and it is expected that the extension of the tunnel will take it into an extensive and permanent body of ore.

On the Canyon Creek side of this mountain, on the same lead, the Montana & Michigan Company have penetrated the lead a distance of about 650 feet and have exposed large bodies of ore that run from a small percentage in copper to 19 per cent, and have put a winze down a distance of about 100 feet and find that in this the ore increases its value with each foot of depth, and while no exploration has been done from the level secured in this way, the winze is all in ore and the lower part of it in a very high grade.

While the work that has been accomplished has not developed rich and extensive mines, it has demonstrated that additional development is almost certain to secure the ore bodies that have been predicted for the lead and bring into existence some very rich properties.

FATAL ACCIDENTS, 1901.

Date.		Name.	County.	Mine.	Cause.
1900					
Dec.	2	John Henry	Silver Bow	Diamond	Killed by cage.
Dec.	19	John McLaughlin	Silver Bow	Adirondack	Fell down shaft.
1901					
Jan.	28	G. W. Kingsbury	Silver Bow	L. E. R.	Falling of cage.
Jan.	28	Anthony Smale	Silver Bow	L. E. R.	Falling of cage.
Feb.	1	Heman Freihland	Silver Bow	Blue Jay	Falling of cage.
Feb.	27	William Faull	Silver Bow	B. & M.	Fell down shaft.
Mar.	9	Gus. Heighman	Silver Bow	St. Lawrence	Fell down shaft.
Apr.	11	Jerry L. Sullivan	Silver Bow	Diamond	Killed by machine.
Apr.	13	Wilson Moffett	Silver Bow	High Ore	Fall of rock.
Apr.	18	Patrick Scanlon	Silver Bow	Moonlight	Fall of rock.
Apr.	22	John Leniouse	Silver Bow	Leonard	Fall of rock.
Apr.	24	Michael Spoo	Silver Bow	Blue Jay	Electricity.
Apr.	26	Tim W. Sullivan	Silver Bow	Diamond	Fall of rock.
May	27	David Hennessy	Silver Bow	Parrot	Fell down air shaft.
June	25	Martin Kramavich	Silver Bow	Never Sweat	Fall of rock.
Aug.	19	John Eustice	Silver Bow	Jessie	Fell down shaft.
July	9	John B. Walsh	Silver Bow	Aanconda	Fall of rock.
Sept.	16	W. H. Rundle	Silver Bow	E. Gray Rock	Fell down shaft.
Sept.	21	Mike Tennent	Silver Bow	Emma Nevada	Fell down shaft.
Sept.	29	James Downey	Silver Bow	High Ore	Fell down shaft.
Oct.	8	James Harris	Silver Bow	Mountain View	Fall of rock.
Oct.	29	Thomas Sheridan	Silver Bow	Diamond	Fall of rock.
1900					
Dec.	19	Oscar Matella	Carbon	R. F. C. Co.	Fall of coal.
1901					
June	6	Stephen Tupper	Powell	Mammoth	Fall of rock.
Aug.	5	Joseph A. Gomas	Madison	Clipper	Explosion.
Aug.	8	Steven Marce	Madison	Gold Hill	Explosion.
Sept.	25	Louis Schropel	Broadwater	E. Pacific	Explosion.
Jan.	4	Hugh Boyd	Lewis and Clarke	Belmont	Fall of rock.
Apr.	16	Thos. Roberts	Lewis and Clarke	Copper Camp	Fell from crosshead while being lowered in upraise.
July	5	Smith Davis	Jefferson	Ada	Fell from bucket while being hoisted to surface.
July	28	John Edwards	Broadwater	E. Pacific Shaft No. 5	Crushed between car and chute.
Aug.	6	W. H. Thomas	Silver Bow	B. & M.	Fell from bucket when being lowered down shaft.
Aug.	6	John Nitto	Silver Bow	Rarus	Fell from ascending cage.
Aug.	13	E. N. Gunville	Jefferson	Minah	Suffocated from gas and smoke from r boiler furnace in tuunel.
Aug.	13	Martin Johnson	Jefferson	Minah	Suffocated by gas and smoke from boiler furnace in tunnel.

NON-FATAL ACCIDENTS, 1901.

Date.		Name.	County.	Mine.	Cause.
1900					
Dec.	2	John Phillips	Silver Bow	Diamond	
Dec.	24	John Donovan	Silver Bow	Parrot	
1901					
Jan.	7	John Egan	Silver Bow	Shaft No. 9	
Jan.	25	John Bowden	Silver Bow	Rarus	
Feb.	24	P. A. Padler	Silver Bow	Original	
Mar.	10	J. N. Banker	Silver Bow	Leonard	
Mar.	27	Moses Draw	Silver Bow	Diamond	
Apr.	9	John Long	Silver Bow	Moonlight	
May	16	John Slatz	Silver Bow	West Colusa	
May	20	Jan Sullivan	Silver Bow	Anaconda	
May	24	John Keegan	Silver Bow	Mountain Con	
May	25	Pete Shea	Silver Bow	Diamond	
June	27	Patrick Greeley	Silver Bow	Rarus	
July	6	Frank Cunningham	Silver Bow	Silver Bow No. 1	
July	11	Charles Hodge	Silver Bow	St. Lawrence	
July	12	Mike McVeigh	Silver Bow	Leonard	
Aug.	23	Mike Murphy	Silver Bow	Parrot	
Aug.	28	Homer Emerson	Silver Bow	E. Gray Rock	
Aug.	31	James Emerson	Silver Bow	Moonlight	
Aug.	31	Andrew McManus	Silver Bow	Moonlight	
Sept.	17	Joe Flynn	Silver Bow	Colusa-Parrot	
Oct.	4	Nick Anderson	Silver Bow	West Colusa	
1900					
Dec.	8	Matt Miller	Carbon	Carbon Coal Co	Fall of slate.
1901					
May	15	Jas. Bassett	Fergus	New Year.	Picked into missed shot.
May	15	Jas. Bailey	Fergus	New Year.	Picked into missed shot.
June	28	Chris. Baumbauer	Lewis and Clarke	Belmont	Picked into missed shot.
June	28	Jas. T. Caddy	Lewis and Clarke	Belmont	Picked into missed shot.
July	1	E. C. Allen	Broadwater	E. Pacific	Picked into missed shot.
Aug.	7	G. S. Margarette	Silver Bow	Minnie Healy	Rock falling through floor.
Aug.	27	William Flanagan	Fergus	Prospect	Explosion of water used for thawing powder.
Oct.	26	Nelson Maxwell	Lewis and Clarke	Drum Lummon	Drilling into missed shot.
Oct.	26	Stephen Shea	Lewis and Clarke	Drum Lummon	Drilling into missed shot.
Dec.	21	Sidney Davey	Granite	Bi-Metallic	Premature explosion.

FATAL ACCIDENTS, 1902.

Date.	Name.	County.	Mine.	Cause.
1901				
Dec. 9	James Robinson	Granite	Bi-Metallic	Fell from cage.
Dec. 28	Fred. Hastings	Beaverhead	Huron	Fell down shaft.
1902				
Jan. 28	Mike Roseel	Granite	Bi Metallic	Suffocated by powder smoke.
Jan. 1	George Caine	Silver Bow	Farrell	Fall of ground.
Jan. 7	John Russel	Silver Bow	Sioux Chief	Fell in winze .
Feb. 9	Jerry T. Conroy	Silver Bow	Diamond	Fall of ground.
Feb. 11	Harry Holm	Silver Bow	Emma	Fell from cage.
Mar. 9	William Salfkey	Silver Bow	Anaconda	Fell from skip.
Mar. 11	Pat Sheehan	Silver Bow	Mountain Con	Powder explosion.
Mar. 11	Eric Hill	Silver Bow	Mountain Con	Powder explosion.
Mar. 14	Joseph Price	Silver Bow	Minnie Healy	Fall of rock.
Mar. 27	Richard Moyle	Silver Bow	Rarus	Fall of rock.
Apr. 1	James Ryan	Silver Bow	Anaconda	Fall of rock.
Apr. 4	W. Cooper	Silver Bow	Berkeley	Fell down ladder way.
Apr. 6	R. J. McKenzie	Silver Bow	Farrell	Caught between cage and wall plate.
Apr. 9	Wm. Williams	Silver Bow	Farrell	Scalded by bursting of water column.
Apr. 17	Robert Maguire	Silver Bow	St. Lawrence	Fell down chute.
Apr. 20	Richard Hancock	Silver Bow	Original	Fall of material.
Apr. 17	Thomas Mooney	Granite	Granite Mountain	Cave-in.
May 6	John J. Shea	Silver Bow	Never Sweat	Fell down shaft.
May 13	John Green	Silver Bow	Gem	Died in shaft.
June 6	John Moen	Silver Bow	Rarus	Powder explosion.
June 9	Wm. Shields	Silver Bow	Never Sweat	Fall of rock.
June 25	Con Magee	Silver Bow	Gagnon	Fall of ground.
July 3	Harry W. Smith	Silver Bow	Pennsylvania	Fell down ladder.
June 18	Joe. McDonald	Silver Bow	Parrot	Fall of rock.
July 6	John Parline	Silver Bow	W. Glengarry	Powder explosion .
Aug. 5	John P. Gleason	Silver Bow	Bell	Fall of rock.
Aug. 26	Michael Sullivan	Silver Bow	St. Lawrence	Fall of rock.
Sept. 13	Chas. Mosher	Silver Bow	Farnham	Fall of material.
Sept. 17	M. P. Flynn	Silver Bow	Rarus	Fall of rock.
Sept. 26	Thos. McLaughlin	Silver Bow	Anaconda	Fell down chute.
Sept. 29	Chas. McMackin	Silver Bow	High Ore	Fall of rock.
Oct. 23	Thomas Devine	Silver Bow	Parrot	Fall of rock.
Nov. 19	Alex. J. McLean	Silver Bow	Diamond	Crushed between cage and wall plates.
Nov. 24	Timothy Hawley	Silver Bow	Never Sweat	Fell down chute.

FATAL ACCIDENTS, 1902—Continued.

Date.	Name.	County.	Mine.	Cause.
1901				
Dec. 20	Jacob Jacobson	Cascade	Bulldog	Premature blast.
Dec. 21	William Williams	Granite	Bi-Metallic	Premature explosion.
1902				
Jan. 12	Wallace A. Pollard	Fergus	Gilt Edge	Struck on head by windlass arm while lowering timbers.
Jan. 13	John Andrews	Broadwater	Eclipse	Cave of ground.
Feb. 11	Cyrus Todel	Madison	Big Show	Explosion of powder thawer. Injured Feb. 8, Died Feb. 11.
Aug. 4	John I. Gillis	Broadwater	Martha W	Killed in shaft by falling bucket.
Aug. 19	Chas. A. Glass	Lewis and Clarke	Columbia	Fell down shaft from surface.
Aug. 24	Craig Samples	Fergus	G. N. Mng. Co.	Suffocated by gas generated by explosion in compressor.
Aug. 24	George Whitcomb	Fergus	G. N. Mng. Co.	Suffocated by gas generated by explosion in compressor.
Feb. 9	Richard Williams	Silver Bow	Diamond	Fall of ground.
Apr. 9	Neil Gillis	Silver Bow	Farrell	Scalded by bursting of water column.

NON-FATAL ACCIDENTS, 1902.

Date.	Name.	County.	Mine.	Cause.
1901				
Dec. 14	Frank Conroy	Silver Bow	Anaconda	Fall of rock.
Dec. 17	P. J. O'Neil	Silver Bow	Diamond	Fell down manway.
1902				
Jan. 17	William Bordick	Silver Bow	E. Gray Rock	Fell down chute.
Jan. 19	Pat Loftus	Silver Bow	High Ore	Fall of rock.
Jan. 22	Pat Mahon	Silver Bow	Diamond	Fall of rock.
Jan. 22	Chas. Christian	Silver Bow	Leonard	Fall of rock.
Jan. 22	C. H. Tabor	Silver Bow	W. Colusa	Fall of rock.
Jan. 24	James Cassidy	Silver Bow	Nipper	Fall of rock.
Jan. 24	P. D. O'Neil	Silver Bow	Anaconda	Fall of rock.
Mar. 7	Geo. P. Holmes	Silver Bow	Anaconda	Fall of ground.
Mar. 7	Joe McCauley	Silver Bow	Anaconda	Fall of ground.
Mar. 22	Dan Egan	Silver Bow	Green Mountain	Fall of rock.
Mar. 22	Joe McNulty	Silver Bow	Diamond	Fall of rock.
Mar. 23	J. P. Hanson	Silver Bow	Rose	Fall of a bucket.
Mar. 23	Fred. Nelson	Silver Bow	Colorado	Caught between bucket and shaft timbers
Mar. 23	Dan D. Sullivan	Silver Bow	Anaconda	Fall of rock.
Apr. 23	John Dennison	Silver Bow	Green Mountain	Falling post.
Apr. 25	William Martin	Silver Bow	Bell	Fall of rock.
May 9	Emil Hanson	Silver Bow	Speculator	Fall of rock.
May 14	Garrett Stack	Silver Bow	Diamond	Fall of rock.
May 16	Thomas McLaughlin	Silver Bow	Anaconda	Fall of rock.
May 23	Simon Champagne	Silver Bow	E. Gray Rock	Struck by machine drill.
May 31	John Lane	Silver Bow	St. Lawrence	Fell down chute.
June 1	Dominick Negro	Silver Bow	Brittania	Struck by falling rail.
June 15	Austin Gibbons	Silver Bow	St. Lawrence	Fall of rock.
June 20	John F. Walsh	Silver Bow	Anaconda	Struck by falling drill.
July 3	Thomas Hennessy	Silver Bow	Anaconda	Fall of rock.
July 5	William Corrigan	Silver Bow	Anaconda	Fell through floor.

NON-FATAL ACCICENTS, 1902—Continued.

Date.	Name.	County.	Mine.	Cause.
July 11	Euclid Sicotte	Silver Bow	E. Gray Rock	Fell down chute.
July 18	A. G. Campbell	Silver Bow	Gagnon	Fall of rock.
July 26	Phil Dougherty	Silver Bow	Moonlight	Fall of rock.
Aug. 16	Mike Hardiman	Silver Bow	E Stewart	Fell down manway.
Aug. 22	Anton Piccola	Silver Bow	High Ore	Fall of rock.
Aug. 22	D. Grandon	Silver Bow	High Ore	Fall of rock.
Aug. 23	J. J. Boyle	Silver Bow	Anaconda	Fall of timber.
Sept. 6	John Ryan	Silver Bow	Pennsylvania	Fall of rock.
Sept. 7	Joe Jeffers	Silver Bow	Ravin	Caught between bucket and wall plate.
Sept. 16	Thomas McCaff	Silver Bow	W. Colusa	Struck by timber.
Sept. 23	James Tredinnick	Silver Bow	W. Colusa	Fall of rock.
Oct. 4	George Coucher	Silver Bow	Parrot	Fall of rock.
Nov. 27	Mike McCarthy	Silver Bow	Rarus	Fall of ground.
Feb. 8	Martin Spiekman	Missoula	Boston	Picked into missed shot.
Jan. 11	W. L. Lindsay	Granite	Prospect	Premature explosion.
May 1	Chas. Myersick	Fergus	Kendall	Fall of ground.

The following article is an extract from an address delivered before the International Mining Congress at its session in Butte during September, 1902, by Dr. George W. King, of Helena, Montana, and formerly of Marysville, where for nearly twenty years he was physician and surgeon to the Drum Lummon Company of that place, and where he obtained a wide and varied experience in the treatment of mine accidents.

The article was entitled "First Aid to the Injured," and while not given in full, the salient points are given and are so full of practical suggestions that they are earnestly recommended to the careful and studious attention of all mine managers, superintendents and foremen and to all others having charge of men employed in in mines.

The illustrations given herewith were kindly loaned by "Mines and Minerals" of Scranton, Pennsylvania :

Accidents from the inhalation of poisonous gases is a subject of special interest to miners, on account of their frequent exposure while working underground. The best ventilated mines are not entirely free from this danger, and as a consequence miners are sometimes overcome by breathing gases collected or generated in stopes or recesses that can not be wholly purified. Where good ventilation has not been provided, as in shafts and tunnels projected by prospectors, the danger is proportionally increased. The attempt to return too soon after blasting has occasioned loss of life. The introduction of compressed air as a motive power in the larger mines is of signal service in this particular. After blasting, the air is turned on and the obnoxious gases driven out before the men resume their labor. The candle test for unsafe air is observed by miners generally. They know what an atmosphere too poor in oxygen to support the flame of a candle is unfit to breathe and precaution must be taken to avoid such localities when it is possible to do so.

They should also understand that this test is not infallible. There may be, and often is, an admixture of gases capable of supporting the flame from a candle and yet deadly when inhaled. Experienced miners can not have failed to note the behavior of the candle flame under these conditions. It flares up with a pale bluish light, due to the presence of a gas known as "carbon monoxide." It is one of the most poisonous gases with which the miners come in contact. A product of imperfect combustion, it is generated by the detonation of explosive compounds, and being colorless, odorless and tasteless, its presence is only made apparent by certain symptoms produced by its poisonous action when introduced into the blood by continous inhalation.

Associated with the ordinary carbon dioxide which infests mines, in as small a proportion as 1 per cent it may prove injurious. A combination of the two gases seems to increase the toxicity of each other. Carbon dioxide is fortunately, less active than the monoxide; moreover, it has a slight taste and oder, and can therefore be more readily detected. The two gases are generally associated together, and the chief concern is to be able to determine when their percentage in the atmosphere has passed beyond the limit of safety.

It is true that a difference exists among individuals in regard to their susceptibility to the action of these gases. One may be overcome in a place where another suffers but slight inconvenence. This fact often encourages the latter to take unnecessary chances. Men of experience and judgment, however, rarely go into a place where the air is known to be bad without being prepared to retreat promptly upon the first indication of danger. What these indications are should be as familiar to the trammer as to the miner himself, for it is among the former class that accidents from inhalation of foul air is most liable to occur. Their work necessitates the handling of loose earth, which is more or less permeated by the gas, which is easily freed by the disturbance and becomes mixed with the air to be breathed. Poisoning by carbon dioxide is at times so insidious that the warning symptoms are unnoticed until too late to escape.

Symptoms of poisoning by carbon dioxide: The smell and taste of the gas usually quite perceptible and this indicates its presence when the percentage is small; nothing more than a dryness of the throat and a slight headache may be experienced. In large amounts the headache becomes more intense, a peculiar throbbing pain is felt over the brow and back of the head. Vertigo supervenes and the sight becomes dim and the limbs weak. There is nausea and vomiting. An uncontrollable desire to sleep comes on and the person falls, never to rise, unless carried out immediately. In an atmosphere completely saturated with carbon doxide, these progressive symptoms are not noted for the reason that all is over in a very few moments.

The result is practically the same as being submerged in water. To rescue those who are insensible, a systematic plan of relief should be adopted. To rush in excitedly but complicates the work, very likely adding to the number already disabled. By forming a relay of men and instructing the one who is to enter to apply a sponge or handkerchief saturated with water, or, preferably, vinegar, over the mouth and nostrils, then to go quickly forward, take hold of the one insensible and drag him to the entrance as far as he can with safety to himself, then retire to give place to the one who stands ready to succeed him, will render the rescue work less hazardous to all concerned. Operating in a shaft is more difficult and dangerous. When the descent is made by a bucket for any considerable distance through a poisoned atmosphere, it is impossible to stand erect within it and maintain an equilibrium after the paralyzing effects of the gas is experienced. A sitting or kneeling posture should therefore be assumed, to avoid the possibility of being precipitated from the bucket. Should descent by ladder way be undertaken, a rope fastened about the waist and manned from above is recommended as a wise precaution. A second rope may be lowered if necessary, and made fast to the person to be brought up by means of a loop drawn snugly around the body close under the arms. The act of hoisting an unconscious person by the aid of a rope must be conducted with reasonable care; the tension ought to be steady lest to forcible contact with jutting timbers or rocks result in serious injury.

The treatment of asphyxia produced by inhalation of poisonous gases will be referred to in appropriate connection.

The prevention of mining accidents has been the subject of much study, and investigation is continually being made by engineers and practical mining men. Legislatures have also endeavored to surround the miners with additional safeguards by legal enactments. Improvement has certainly been made, and with the advent of electricity for the purposes of lighting and motive power, further progress will be made evident in the equipment of mines that are to be operated in the future. Were it possible to exclude the accidents which are clearly preventible, the occupation of mining would be less hazardous and the mortality lessened, a result most helpful and worth striving for, since at the best there will be fatalities enough and to spare.

Taking the practical view, then, that with the best equipment and most efficient service accidents may and do happen, the care of the injured must be considered with reference to their immediate necessities. To be prepared for emergencies is the first essential. This refers to the few medicines and appliances that may be needed for temporary use. These articles should be kept in reserve at the most accessible station wihtin the mine and plain and concise directions for their proper and legitimate indications posted in a conspicuous place that all may have the privilege of learning how and what to do for others in case of need. To avoid unnecessary complications, the list of articles must be limited to the actual requirements. Enumerated, it would appear as follows: One-half dozen bandages, two and one-half to three inches in width and one yard in length; one package of absorbent cotton; one roll of adhesive plaster; one dozen safety pins; galvanized wash bowl, soap and towel; temporary splints for the limbs; a litter; one cylinder of compressed oxygen gas, with inhaling mask; medicines other than stimulants are not indicated. Two ounces of aromatic spirits of ammonia, with a small flask of brandy are added for the latter. The medicines and dressings may be stored in a tin box with a tightly-fitting cover, and the whole protected from moisture. After an accident the danger to be apprehended to those who are severely injured depends in a measure upon the length of time which must elapse before medical aid can reach them. This period varies from a few moments to several hours, according to circumstances. During this interval of waiting what is to be done? In some instances nothing; in others, prompt action must be taken to save life. Upon those who are present, or first to arrive, devolves the duty of attending to the immediate necessities, whatever they may be, as best they can. The demoralizing effect of an accident upon those who witnessed it is apt to be harmful in two ways; first, by causing delay when time is the important factor; second, by inciting too energetic attempts at rendering assistance. It is therefore well to remember that, however alarming the situation, calmness and presence of mind is all important.

Undue excitement contributes to render the chances of succor less certain, if not impossible. One who is competent to do the right thing, whenever and wherever such service is imperative, exerts an influence most assuring and helpful to those in peril and to those who must assist in their care. Gentleness without timidity is of inestimable value in this service under all conditions.

In caring for the injured there are certain things to do, applicable in all cases and we therefore begin by placing the individual in a recumbent and easy position and proceed to loosen the clothing about the neck and chest, and if the patient is able to swallow and there is no excessive bleeding, external or internal, from wounds or concussions a moderate amount of whisky or aromatic spirits of ammonia may be given as a temporary stimulant. If stunned and unconscious, no attempts to give fluids by the mouth ought to be made, owing to the liability of their entering the windpipe and causing suffocation. Cold water may with advantage be sprinkled upon the face to excite effort at breathing. Friction applied to the extremities, being careful to select those which are not injured, is a healthy measure. Heat applied externally is indicated when the surface of the body is cold and the circulation feeble. When reaction has become established the limbs should be examined, one by one, and in the same careful manner the chest, abdomen and head. In this way the injuries cannot fail to be noted. When there is dangerous hemorrhage, caused by wounds and fainting from loss of blood ensues, appropriate means to control it must be employed promptly. To arrest bleeding different methods are employed, all more or less mechanical. Pressure is the readiest and most effective means for the temporary control in urgent cases. To apply the fingers over the course of an artery and compress it sufficiently to shut off the current of blood requires but an instant and this advantage in time is not to be overlooked, especially when a large vessel is wounded.

Troublesome bleeding from wounds in the palm of the hand is effectually checked by similar methods. Digital compression of the large arteries of the thigh is more difficult owing to the large mass of muscles by which they are surrounded. Resort must be sought in more effective methods. The limb should be elevated and a small firm pad placed over the artery; then a handkerchief or piece of rope is made to encircle the limb over the pad, a sharp stick introduced into the loop and twisted upon itself until the bleeding is effectually controlled.

Cold is an effective means of checking oozing from small twigs of arteries on veins. Ice, snow or cold water is placed in contact with the bleeding surface. Heat is equally serviceable and is applied by means of compresses dipped in hot water. In deep wounds, when the source of bleeding is obscure and the condition of the patient is critical, packing the wound with strips of gauze or with absorbent cotton is permissable. After removing blood clots the gauze or cotton is forced into the bottom of the wound and the cavity filled and a bandage firmly applied to the parts. In these manipulations absolute cleanliness is to be insisted upon to prevent infection. The hands of the operator should be thoroughly scrubbed with soap and water and the dressings kept free from contamination with as much care as possible.

Internal bleeding, induced by serious injuries, unfortunately is not amenable to active treatments and we must content ourselves with insisting upon perfect quietude, administering cool drinks and applying cold compresses over the affected region. These simple means may appear insignificant and of doubtful utility in the presence of grave conditions and the temptation to do something more radical in the way of treatment is at times difficult to resist. A moment's reflection upon the indications to be met should establish the fact that the immoderate use of stimulants or active movements of the patient tend to deviate the object we have in view, viz: to favor the formation of a clot at the point of rupture of the artery or vein, nature's method of arresting hemorrhage. Fainting is a saving incident and may be so regarded unless the weakness is progressive and the shock so profound as to threaten immediate death. In the latter emergency, stimulation and warmth must be the treatment. It is to be understood that surgical skill is required to deal with such extreme cases. The suggestions above outlined are for the benefit of those who are uninstructed in the treatment of severe injuries. First aid applies only to the temporary care of those who are disabled and helpless; with that its utility ceases. Some injuries disable without endangering life, as instanced in the case of fractures of the limbs. Here some support is needed to steady the fragments during transportation. The resuscitation of those who have been overcome and rendered unconscious by inhalation of poisonous gases is necessarily first aid work. The question of how to accomplish this object must be considered. Little can be done before removal to a location where the air is comparatively fresh. Then cold water dashed into the face and friction applied to the limbs will stimulate the resumption of breathing. Should it fail to do so artifical respiration must be resorted to at once. It consists of forcing air into the lungs by imitating the natural act of breathing. The steps of the procedure are as follows: Place the patient upon his back, with head and shoulders slightly elevated; loosen the clothing and cleanse the mouth and nostrils; pull the tongue forward and bring it out of the angle of the mouth, to remove all obstruction to the entrance of air. The operator then kneels at the head of the patient and reaching forward grasps the arms near the elbows and carries them up in an extended position. This maneuver creates a vacuum in the lungs, allowing air to enter; the arms are held in this position for two seconds and then carried downward and pressed firmly against the sides, forcing air from the lungs by compression. This to and fro movement is kept up at the rate of fourteen or fifteen per minute until there is a return of natural breathing, usually signaled by a voluntary gasp on the part of the patient. This is the most reliable of all methods of restoring suspended animation, caused by inhaling carbonic dioxide; air must be gotten into the lungs, either by the force or natural act of breathing. Otherwise the case is hopeless. This is true for physiological reasons, which can not be discussed here. Suffice it to say that under normal conditions oxygen freely enters the blood by way of the lungs and its presence there is essential to life. As soon, therefore, as the breathing becomes regular the inhalation of oxygen gas may be begun and continued until the livid color of the skin becomes less marked and consciousness returns. In the absence of the oxygen gas, stimulants are next to be thought of, as soon as there is ability to swallow. Whisky or armotic spirits of ammonia are choice. Ammonia has the property of quicker action, but is less durable than that of alcohol. Sniffing the fumes of ammonia is also useful. When patients begin to revive there is apt to be cramping of the limbs or general convulsions. This requires no treatment beyond protecting them from injuring themselves by the convulsive movements. The cases need watching for some hours, for it may happen that those who are apparently out of danger will suffer a relapse and become again unconscious and die if left to themselves. The lifting and carrying of the injured is apt to be awkwardly done by men inexperienced in such service. Many injuries are of such a nature that misapplied force will further complicate the lesions which already exist, if indeed it does not lead to irreparable damage. A simple fracture of the leg may be converted into a compound one by injudicious handling. An unnecessary laceration of tissue is produced and consequent suffering, besides adding to the gravity of the case. This is but one of the many things which may happen to the disadvantage of the patient during transportation. To lift an injured person properly requires three bearers. Two should stand upon opposite sides in a position to support the upper part of the body, the third where he can conveniently take care of the lower extremities. Then, with the patient upon his back, all drop upon one knee, the two principal bearers pushing their arms under the back and locking hands firmly together. The third pushes both arms under the limbs. At a given signal all arise to their feet. The weight is thus so easily distributed as to be easily borne and there is no appreciable jar or sudden twisting of injured parts.

A litter devised by the writer is especially adapted for underground work and insures absolute safety in whatever position it may be placed. By its use in mining accidents the difficult problem of getting those severely injured to the surface without discomfort or danger is satisfactorily solved. The litter with its burden may be put upon a cage or in a bucket and when fastened in appropriate position may be brought up without disturbing the position of the patient. To the litter a rope is attached to one end and a guy line to the other, the latter being used to steady it during transit. When the upright position cannot be maintained, owing to syncope, from loss of blood, a semi-horizontal or even reverse position may be chosen for the time being in order to allow the remaining blood to gravitate toward the heart and brain, an expedient that is sometimes useful in extreme cases.

The fastenings are so arranged that the position of the patient is not changed with reference to the litter while executing the different movements of hoisting or transporting through narrow passages, thus affording additional security and dispensing with an extra number of bearers. In practice this plan has proven an excellent one. The litter is inexpensive and durable. After being brought up to the surface the injured are given over to the care of a physician or placed in an ambulance for conveyance to the hospital and the duties pertaining to the first aid are practically ended.

In rendering first aid to the injured simple methods are to be preferred. They are always available and, moreover, within the comprehension of any one possessed of ordinary intelligence and can by them be easily put in practice at the time and place most urgently demanded.

Officious and meddlesome interference is to be avoided. It is never necessary and may do harm. There are certain definite things to be done in sudden emergencies. Common sense and prudence should dictate the course to pursue in every instance. The rule to do no harm is a good one and should be kept in mind at all times. Its observance is never a cause of regret, but, on the contrary, an evidence of a true desire to keep within the limits of safety—a most commendable qualification in the non-professional when called upon to take an active part in the care of the injured.